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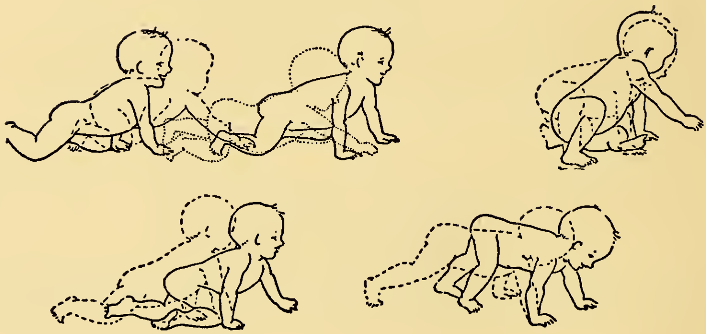
THE PSYCHOLOGY OF EARLY CHILDHOOD

The PSYCHOLOGY *of* EARLY CHILDHOOD

The PSYCHOLOGY *of*



EARLY CHILDHOOD

by Catherine Landreth

University of California, Berkeley

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FOREWORD

by Harold E. Jones

The author of the present volume is a specialist in children as well as in child psychology. Textbooks sometimes give the impression of having been written by persons whose primary knowledge is derived from other textbooks. Dr. Landreth, however, has had the background of a long term of experience as director of the Institute of Child Welfare Nursery School. Many hundreds of children have been enrolled in this school, and have been under observation and systematic study by the teaching staff and by the students in Dr. Landreth's University classes.

These children and their parents represent a normal rather than a clinical sample. Although the concept of "normal" includes a very wide range of characteristics, a group assembled for the purpose of a school is in the main quite different from a "problem" group selected as needing individualized therapy. It is appropriate that a general text on child psychology should stem from the former rather than the latter background.

A well-balanced treatment of child psychology should bring the student an appreciation of the complex roles of developmental or maturational factors and of learning in child development. It should help the student to see the importance of individual differences, both at a given age and in patterns of development. It should help him to see the interrelationships of traits and the role of the family environment and of other environmental agencies, as the child moves forward from infancy into early and later childhood. Above all, it should be oriented toward the results of research, with a commonsense rather than a prescriptive or dogmatic attitude in suggesting the application of these results in individual cases. These requirements are met in the present book.

Child psychology is a field of study with its own characteristic problems, theories, and methods. Dr. Landreth wisely treats this field as one that is not yet fully structured and integrated. It includes areas of exploration as well as areas of systematic theory. It is best understood, and the behavior and development of individuals is usually better understood, by students who are not too exclusively devoted to a single theoretical point of view.

At the present time it is not possible to write a one-theory dis-

cussion of child development (resting, for example, solely on psychoanalytic or solely on sociological or biological concepts) without ignoring segments of knowledge which are important but relatively isolated, or without a biassed forcing of data into preconceived channels. Dr. Landreth has avoided these academic pitfalls, and in so doing has produced a book that is marked by breadth as to topics and a judicious care in interpretation.

In some of the older sciences much of the material in a textbook has been public property for a long time, and has achieved a more or less standard formulation. This is less true of such a discipline as child psychology, which rests so largely on contributions of the past two or three decades. With so large a proportion of the studies being recently done, the summarizer has an exceptionally difficult task of selecting, organizing, and making a clear and interesting presentation. The present volume is a good example of how this can be done.

Harold E. Jones

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PREFACE

For Several Years I have taught a course on the psychology of early childhood to college students planning professional work as home economics teachers, nursery school or kindergarten teachers, social welfare workers, clinical psychologists, pediatricians, or nurses. These students are interested in child psychology as a basic science and as a guide to action. This book is written for them.

Most of these students when presented with a generalization about the behavior of young children want to know on what that generalization is based. All generalizations in this book are therefore discussed in terms of the research from which they were derived. With factual evidence of this sort the reader is given an opportunity to develop his own judgment rather than simply accepting that of the writer.

Most students' interest in child psychology is practical as well as scientific. They want to become more discerning and more effective in their contacts with specific children. I have therefore drawn liberally from my own nursery school experience and have used many incidents in this book to suggest concrete practical applications of research findings. These, along with a suggested list of films and the student observations that normally accompany a course in child psychology, should help to relate research findings to childrens' everyday behavior.

To assist students in focussing their reading on the generalizations we can now make about child behavior, on the research findings from which the generalizations are derived, and on the application of these findings and generalizations, I have used a device found helpful in teaching. Introductory questions are posed at the beginning of each chapter to stimulate selective interest.

In preparing this book I have had help from many persons, among them the students and young children whom I have taught and learned from. I have also been helped by the comments and criticisms of colleagues in the University of California who read one or more chapters of the original manuscript. To Dr. Aloha H. Alava, Mrs. Wilma Buckman, Dr. Dorothy H. Eichorn, Dr. Marjorie P. Honzik, Professor Harold E. Jones, Dr. John P. McKee, Professor Jean W. Macfarlane, Dr. Ian W. Monie, Professor Agnes Fay Morgan, Dr. Samuel R. Pinneau, Professor Leo J. Postman, and Professor Theodore R. Sarbin, my grateful appreciation for this help.

To Professor David Krech who read and edited the entire manuscript I am specially indebted both for his critical judgment and his unfailing encouragement.

Sincere appreciation is also due the editors of the following journals who granted permission to reproduce charts and graphs: *American Psychologist*, *Annals of Eugenics*, *Child Development*, *Child Development Monographs*, *Genetic Psychology Monographs*, *Journal of Experimental Education*, *Journal of Experimental Psychology*, *Journal of Genetic Psychology*, *Journal of Pediatrics*, *Journal of Speech and Hearing Disorders*, and *Monographs of the Society for Research in Child Development.*

Acknowledgment of similar courtesy from publishers and authors who permitted reproduction of figures for which they hold copyright is made beneath each such figure.

I am in addition indebted to John Wiley and Sons, Inc., New York, for their generous permission to reproduce some behavior incidents from the textbook, *Education of the Young Child*, and to Dr. M. E. Davis, Dr. D. Hooker, Dr. D. B. Lindsley, Mrs. P. Donelly, Alta Bates and Kaiser Foundation Hospitals, and the Psychological Corporation for permission to reproduce photographic plates.

Others to whom I am indebted are Frances C. Baxter and Marjorie E. Pond for typing, Katherine C. Eardley for drafting, Walter B. Schwarz for anatomical illustrations, and Eleanor Boydston, Dora Jensen, and Margaret Tooley for assistance in the mechanical tasks of preparing the book.

Finally there are many biological and social scientists, living and dead, to whom my indebtedness, though less easy to specify, is no less real. They are those whose thinking has stimulated and become a part of my own. To them, humbly, my thanks.

C.L.
Berkeley, California

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Chapter 1

THE ORIGINS OF CHILD PSYCHOLOGY

THIS IS a book about the development of behavior in young children in our society. You know something about this already. You have been a young child yourself and you have known other young children. What you know, of course, is limited by the particular kinds of experience you have had with the particular children you have known. It is also limited by the way you feel about both the experiences and the children.

In beginning a study of the research literature on young children's behavior, you should keep in mind that what research workers in this field know is also limited: by the kinds of questions they asked in setting up their studies, by the kinds of child populations they studied, by the methods they used, and by the interpretations they made of their research results.

Because of this one cannot make generalizations about young children's behavior, at least not to an intelligent reader, without some reference to the source of these generalizations. This book, therefore, includes some account of methods used in studying young children's behavior and some reference to psychological theories that have stimulated certain lines of investigation.

Following such an account will call for some understanding of statistical measurements. It will not, however, demand the kind of technical knowledge that would be required by a similar account of research methods in one of the older sciences, such as physics. This is because the systematic study of young children's behavior is a relatively recent development. A survey (Dennis, 1949) of studies made prior to 1882 lists only 42 publications.

Diverse Beginnings of Child Psychology

Though recent, the beginnings of child psychology are diverse. Early investigators interested in the behavior of young children included physicians (one kept a record of the health and development of Louis XIII), physiologists, biologists, educators, philosophers, psychologists and statisticians. This diversity in the educational preparation and professional pursuits of persons interested in the study of children's behavior continues to the present day. It accounts for the variety of scientific and professional journals in which publications concerning young children can be found. It also accounts for some of the difficulties you may have had in assimilating information concerning children's behavior from writers in different professional fields.

Current Emphases in Child Psychology Stemming from Work of Late Nineteenth and Early Twentieth Century

The diversity of its origins is reflected in the directions that the scientific study of young children's behavior has taken during the twentieth century. There are at least five discernible directions or emphases which seem to have their source in the ideas of scientists working in the last half of the nineteenth or the beginning of the twentieth century.

Longitudinal Developmental Studies of Behavior

The first stems from the work of Darwin, a biologist, and Preyer, a physiologist. Each (Darwin, 1877, and Preyer, 1882) kept a diary of the behavior of his infant son and each compared the behavior of infancy and early childhood with that of other animal species. Their method of study, which was essentially that of repeated cumulative observations on the same subject, was the forerunner of the twentieth-century longitudinal approach to the study of behavior in large groups of children. Their focus of study, which was that of the development or natural unfolding of behavior in different animal species, was also the focus of early twentieth-century studies that defined stages in the development of behavior and related these stages to the maturity of the nervous system.

Statistical Study of Behavior

A second influence is traceable to the reports of two scientists, a Frenchman, Quetelet, and an Englishman, Galton. Both observed that when measures of physical attributes such as height and weight were made on large numbers of individuals that there was a considerable range or distribution of measurements. This quantitative evidence of diversity in human characteristics suggested that all such characteristics might profitably be studied in terms of the frequency and probability of their occurrence. Thus the way was paved for the statistical study of behavior.

At the turn of the century three other scientists, one Russian, one French, and one Austrian, published reports that have influenced not only the course of child psychology, but also the child-rearing procedures in numbers of families in this country during the last fifty years.

Study of Conditioned Responses as a Basis of Early Learning

Pavlov (1903), reporting his work on dogs, described how he had experimentally produced salivation in response to a variety of stimuli by putting dogs through a training period in which a neutral stimulus, such as the sound of a bell, immediately preceded the giving of food. The conditioning process resulting from associating this neutral stimulus with one which produced a biological response furnished a clue to the learning process in early childhood and to the development of a mechanistic theory of behavior—behaviorism, which dominated the study of young children's behavior during the 1920's.

Study of Intelligence by Means of Standardized Intelligence Tests

Binet (1905), seeking an answer to the question of why some French children failed and some succeeded in their school work, devised a test of mental functioning and a method of scoring performance based on the percentages of children of a given chronological age who were able to pass individual test items. The mental tests and mental age scores which Binet thus developed provided a new dimension in considering growth and development of children. They also

furnished the most widely used research tool in studying children's behavior for the next half century.

Interpretation of Behavior in Terms of Individual Motivations

Freud (1938), on the basis of his observations on neurotic upper middle-class European adults, concluded that the motivation of human behavior is emotional rather than rational, that man is dominated by strong instinctive drives, in particular by those of sex, that memories suppressed into the unconscious and forgotten may be more significant determiners of behavior than the content of the conscious mind, and that early childhood is the period of life predominantly concerned with the origin of neuroses. Freud's conclusions, though revolutionary, were not completely unrelated to previous thinking on the motivation of behavior. His concept of an "id" dominated by instinctive drives had points of similarity with the theologians' original sin. His "superego" concerned with maintaining standards of behavior likewise offered a secular version of the theologians' concept of the soul; and his "ego," concerned in part with facing reality, was somewhat representative of human involvement in temporal matters.

The influence of Freud's writings on the scientific study of young children's behavior lies in the fresh approach he offered to the understanding of human behavior. He did not contribute a specific method of investigation directly applicable to young children, as Binet did, nor did he offer readily verifiable generalizations on the periods of early childhood. What his theory did offer was a powerful stimulus to attempts to interpret behavior in terms of individual motivations. This in turn led to the development of what are called projective techniques. Briefly, projective techniques aim at revealing an individual's dominating, but perhaps suppressed, interests and wishes by obtaining his responses to materials which can be used or interpreted in a variety of ways. One example of such materials is a series of dolls representing the members of a child's family. A child's responses to members of this doll family in a play situation are interpreted in terms of projected attitudes toward his own family members. In such a situation a seemingly docile child who is inwardly seething with resentment against his parents may do to the doll parents what he does not feel free to do to his own.

These five directions, or emphases—longitudinal developmental studies of behavior, the statistical study of behavior, the study of conditioned responses as the basis of early learning, the study of intelligence

by means of standardized intelligence tests, and the interpretation of behavior in terms of individual motivations—are not the only ones discernible in the scientific study of young children's behavior. But they are the ones that seem to owe their inspiration to scientific developments of the nineteenth or very early twentieth century.

In the following chapters, other directions and emphases will become apparent. I hope, however, that you will not limit your interest in young children's behavior to reading what other people have written about it. What has been written gains interest and relevance when it is related to the behavior of actual children. Supplement your reading with repeated observation of young children in their natural habitat of home or nursery school; you will be rewarded by finding that you not only learn something about young children, you also learn something about yourself.

Recommended Reading

In addition to the references that follow, students will find an interesting ten-page summary of "Historical Beginnings of Child Psychology," by Wayne Dennis, in the *Psychological Bulletin*, Vol. 46, May 1949.

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Chapter 2

PRENATAL ORIGINS OF BEHAVIOR

What is the earliest point in individual human identity?

How do we account for likenesses and differences in physical characteristics of children of the same parents?

Why are identical twins more alike than fraternal ones?

What are developmental hazards of the first two months of prenatal life?

How does the prenatal environment differ from the postnatal one?

What is the range in length of prenatal life?

Can the circumstances of a pregnant woman's life affect the development and well-being of the fetus she carries?

What is the earliest activity of which the fetus is capable?

Why are fetuses more active at some times than others?

How is prenatal behavior studied?

How does fetal behavior during the last month of prenatal life differ from infant behavior during the first month of postnatal life?

ALL HUMAN BEHAVIOR has roots in the past: in the past of the individual and of his forebears, in the past of human society and

of the animal kingdom of which human beings are but one species. It is, therefore, worth spending some time considering what relationships there may be between the circumstances of an individual's prenatal past and his behavior at and after birth. Such relationships are possible because some stages in the prenatal development of a human being are critical for the development of congenital characteristics; some uterine environments are more favorable for prenatal development than others; and some kinds of behavior begin to develop before birth.

Stages in Prenatal Development Critical for Development of Congenital Characteristics

The Stage at Which Genetic Inheritance is Transmitted

The first critical stage in an individual's development is the one which determines the particular combination of characteristics he inherits from his forebears. To appreciate what happens during this stage, we must review briefly what is known of the way in which genetic inheritance is transmitted.

Each cell in the human body contains the determiners of inherited characteristics in the form of 23 [1] pairs of chromosomes. One member of each pair carries the characteristics inherited from the mother, the other those inherited from the father. Each chromosome consists of a specific number of small units—genes—arranged in a definite order. Each gene in each chromosome contributes to the inheritance of one or more specific characteristics, for example, eye color.

Before a male and female sex cell are capable of union, each undergoes a maturing process. As part of this process each cell divides in two in such a way that the resulting cells contain only *one member* of each pair of chromosomes or 23 chromosomes in all. The union of a mature male and female sex cell at conception thus reconstitutes the number of chromosomes, 46, that is specific for most members of the human species, and thereby establishes the genetic inheritance of an individual. (See Figure 1).

What this genetic inheritance is depends upon which member of each pair of chromosomes, the maternal or the paternal one, is represented in the functioning male and female sex cells. As chance determines this assortive process, many chromosome combinations are possible. To indicate how many, if there were only one pair of

[1] Some individuals may have an additional pair of chromosomes.

chromosomes aa^1 in the female and one AA^1 in the male sex cell, four possible combinations could result at conception, aA, aA^1, a^1A, AA^1. If there were four pairs of chromosomes, 256 combinations would be

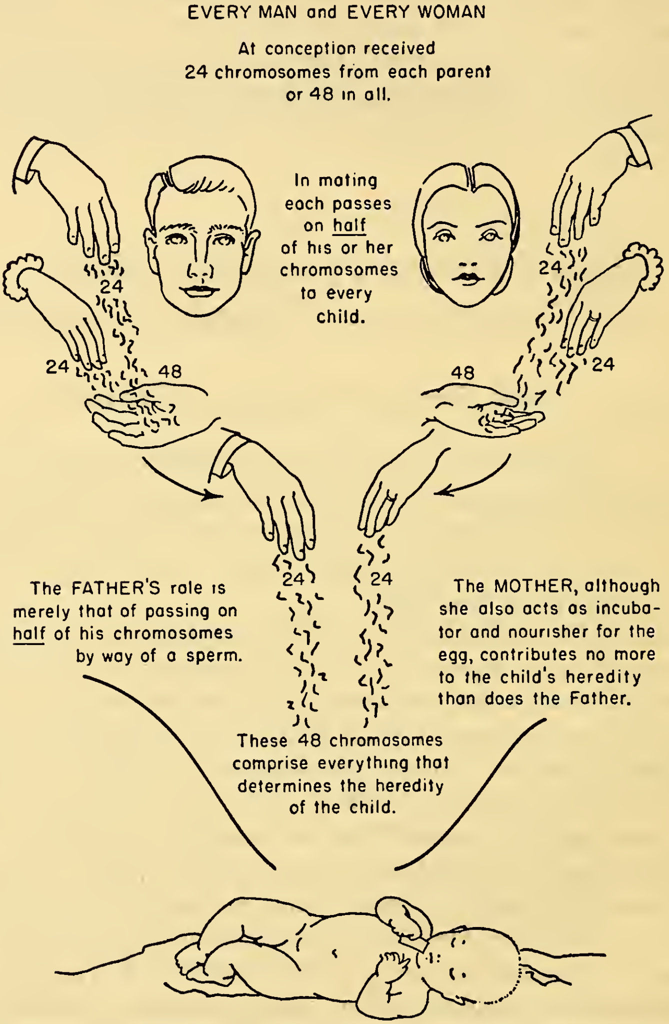

Figure 1. Transmission of genetic inheritance. From Amram Scheinfeld, *The New You and Heredity.* Copyright 1939, 1950 by Amram Scheinfeld. Published by J. B. Lippincott Co. By permission of the publisher. According to the most recent evidence, there appear to be twenty-three pairs of chromosomes in human beings, instead of twenty-four as was previously believed.

possible. As there are actually 23 or 24 pairs of chromosomes in each sex cell, over 16 million combinations are theoretically possible. To add to this diversity, it is possible for the members of each pair of chromo-

somes to "cross over" or exchange with each other at the time of division. Having or separation of such a crossed-over pair results in a chromosome which contains some maternal and some paternal genes. (See Figure 2.)

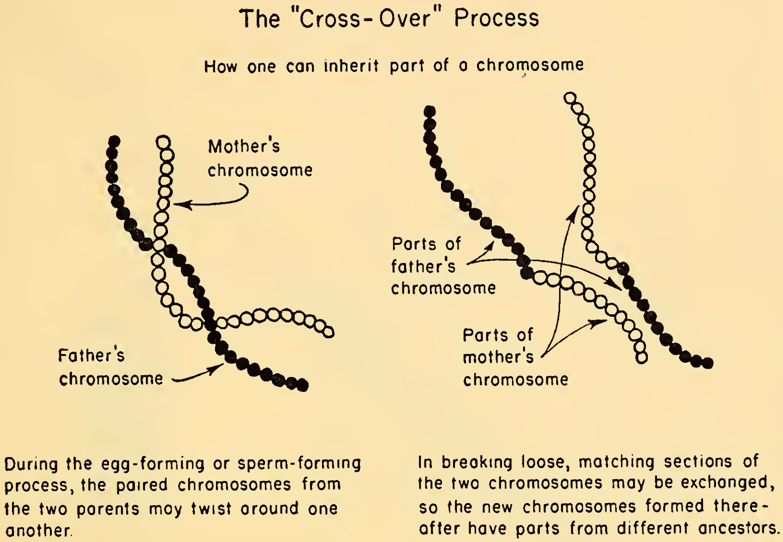

Figure 2. The "cross-over" process. From Amram Scheinfeld, *The Human Heredity Handbook.* Copyright 1956 by Amram Scheinfeld. Published by J. B. Lippincott Co. By permission of the publisher.

Chance, then, plays a part in the native endowment of individuals, determining which of a vast number of possible combinations of characteristics they inherit. It is this chance assortment of chromosomes during the maturing of the sex cells that also accounts for likeness and difference in family members reflected in such measures of relationship as a correlation of .5 (approx.) between mental test performance of children and one of their parents.

To understand what this relationship means we must remember that the predictive value of a correlation equals the square of the correlation. If all children had the same mental test scores as either of their parents, the correlation would be 1 and we could predict any child's test score accurately if we knew the score of one of his parents. With a correlation of .5 the best we can do is average a 25 per cent better prediction of the range within which a child's test score will fall if we know the score of one of his parents than we can if we don't know it. Another way of putting this is that, with a .5 correlation, we can make a 25 per cent better prediction than chance. Figure 3, which

shows a scattergram of a correlation of approximately .5 between siblings' mental test scores, makes clear how small a proportion of perfect agreements are obtained in a .5 correlation.

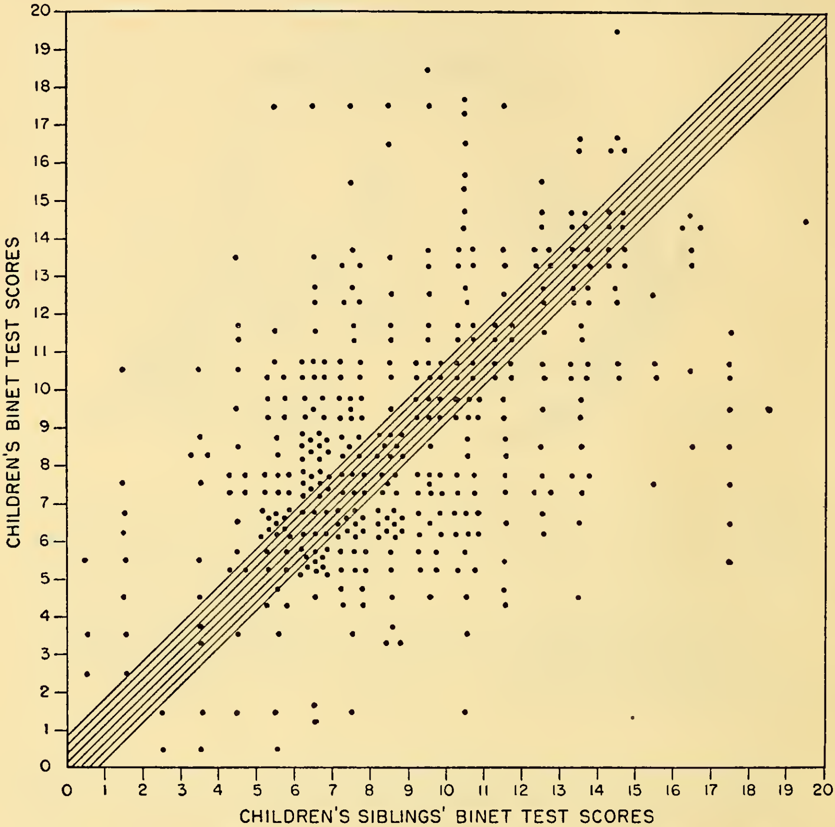

Figure 3. Scattergram of a correlation of approximately .5 between intelligence test scores of siblings. From H. S. Conrad and H. E. Jones, "A Second Study of Familial Resemblance in Intelligence," in Part II, *Thirtyninth Yearbook*, National Society for Studies in Education, 1940, pp. 97–141. By permission of the authors.

This kind of relationship is worth keeping in mind when we are tempted to make sweeping generalizations about the inherited characteristics of our own or any other family. Actually a particular child *may* resemble his grandfather or some remote ancestor more than he does one of his parents or brothers and sisters. Then again, he may show little likeness to any relative living or dead. Hence the absurdity of speaking of a child with a Negro grandfather as being one-fourth Negro, as though what a child inherited from an ancestor depended solely on how far back the ancestor was. (See Figure 4.)

Chance also determines the sex of an individual. One of the 23 pairs of human chromosomes is concerned with the determination of sex. Unlike the other 22, this pair may consist of two different types of chromosomes; a large one with many genes usually referred to as the X chromosome and a small one with few genes referred to as the

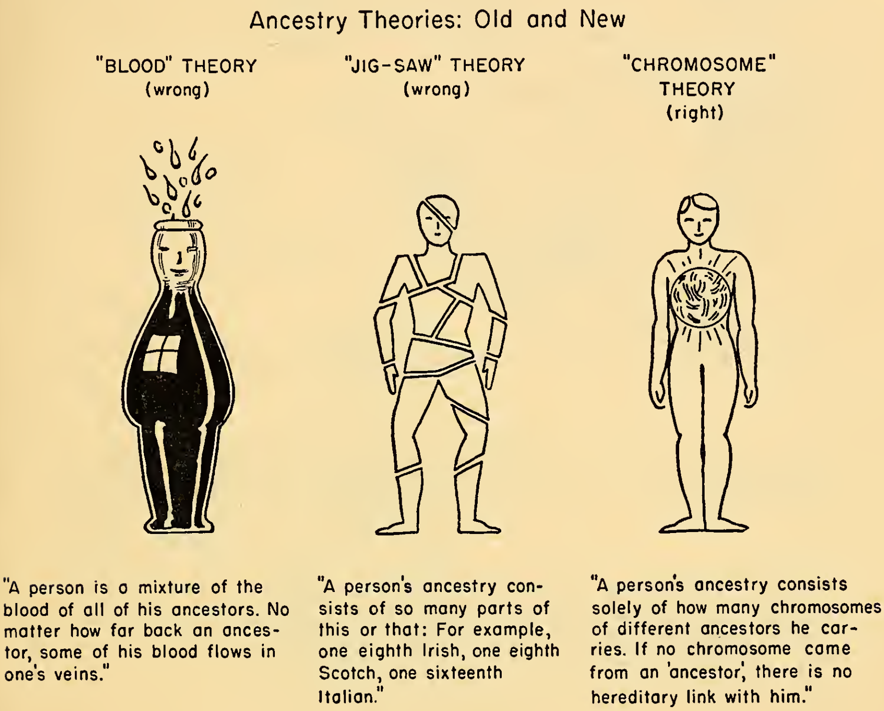

Figure 4. Ancestry theories: old and new. From Amram Scheinfeld, *The Human Heredity Handbook.* Copyright 1956 by Amram Scheinfeld. Published by J. B. Lippincott Co. By permission of the publisher.

Y chromosome. In females the pair consists of two X chromosomes, in males of an X and a Y chromosome. Therefore, during the maturing process, already referred to, all female sex cells receive an X chromosome, while half the male sex cells receive an X and half a Y chromosome.

As a result (Figure 5) female sex cells fertilized by male sex cells carrying an X chromosome are female conceptions, those fertilized by a male sex cell carrying a Y chromosome are male conceptions.

The reason a sex cell receiving two X chromosomes results in a female conception is that there are sex influencing genes, slanted in the direction of maleness, in the other 22 pairs of chromosomes. Two X chromosomes slanted in the direction of femaleness are therefore re-

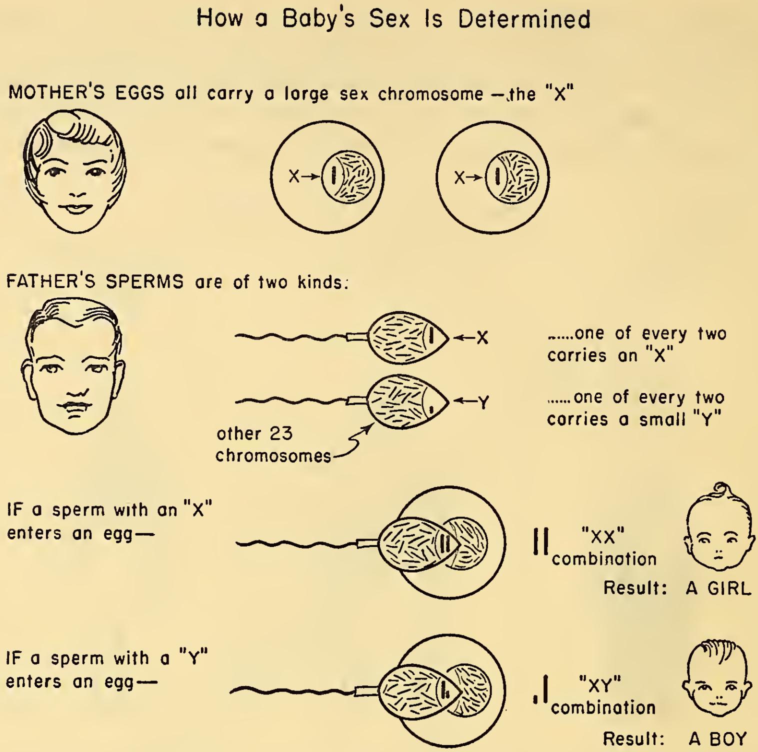

Figure 5. How a baby's sex is determined. From Amram Scheinfeld, *The Human Heredity Handbook.* Copyright 1956 by Amram Scheinfeld. Published by J. B. Lippincott Co. By permission of the publisher.

quired to overbalance the action of the genes in the other chromosomes. Figure 6 suggests the kind of balancing action that takes place.

On the basis of what must be a 50–50 production of X and Y carrying the male sex cells one would expect the number of male and female births to be approximately the same. Interestingly enough, this is not the case. The proportion of males to females in newborn white infants in the United States is 106 to 100. Further, this proportion does not seem to be the result of a higher prenatal death rate for females; the proportion of males to females in a sample of 6000 embryos and fetuses in the Carnegie Institution is 107.9 to 100. No satisfactory explanation has yet been advanced for what would seem a balancing action on the part of nature in producing a greater proportion of what is, at all ages, the more perishable sex.

Males are not only more perishable, they are more likely to have congenital abnormalities. Why this is so may perhaps be related to the fact that they lack the balancing influence of a paired X chromosome.

This influence is exerted as a result of an interactive process between the two members of each pair of genes.

A modifying factor in the inheritance of characteristics is the kind of relationship between the two members of each pair of genes. The members of each pair of genes have an interactive relationship, in

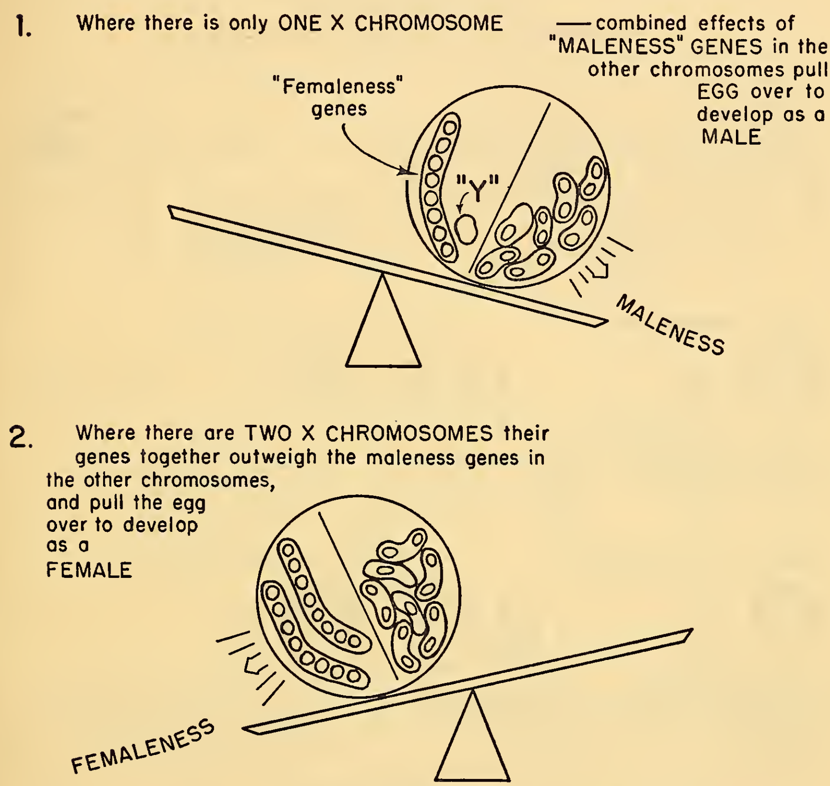

Figure 6. Balancing action of X and Y chromosomes in determining maleness or femaleness. From Amram Scheinfeld, *The New You and Heredity.* Copyright 1939, 1950 by Amram Scheinfeld. Published by J. B. Lippincott Co. By permission of the publisher.

which one may assume a dominant and one a recessive role.[2] The dominant gene determines the particular characteristic the individual inherits. In the case of males, recessive defect-transmitting genes in the X or Y chromosome cannot be modified by a paired dominant gene. Therefore, sex linked abnormalities occur more frequently in males. This is illustrated in the transmission of color blindness in Figure 7.

Recessive genes are of course not limited to the X and Y chromo-

[2] This, however, is not the *only* type of interactive relationship between members of a pair of genes.

some nor are all of them transmitters of abnormality. There are, though, instances in which the chance pairing of two recessive genes may have far-reaching influence on the life of an individual. One such extreme and rare instance is the transmission of infantile amaurotic idiocy by two recessive genes.

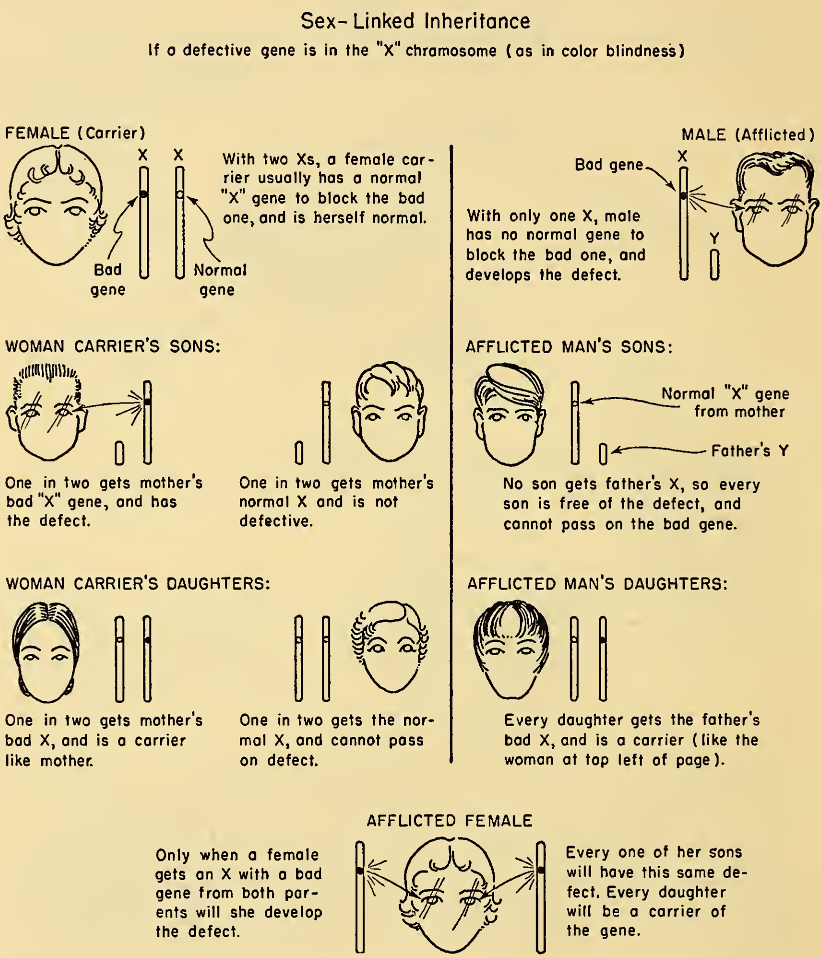

Figure 7. Sex-linked inheritance. From Amram Scheinfeld, *The Human Heredity Handbook*. Copyright 1956 by Amram Scheinfeld. Published by J. B. Lippincott Co. By permission of the publisher.

At conception, then, which is the earliest point in individual human identity, some limitations are already set for the future development of a human being. The source of these limitations is the individual's inheritance of characteristics that determine in part his future behavior.

A second critical stage occurs during the phase of cell division and differentiation at which twinning may occur.

The Stage of Cell Division and Differentiation at which Twinning May Occur

Fertilization of the female sex cell by the male sex cell, in addition to determining individual inheritance, also stimulates cell division. After repeated divisions the resulting cell mass assumes a mulberry-like appearance and has a cavity inside (see Figure 8). Attached to the wall of this cavity is an inner cell mass which differentiates first into two and then into three types of cells or cell layers from which the embryonic disc (the forerunner of the embryo) develops. From two of these types of cells are also developed the membranes of the amnion and chorion within which the embryo lies. (See Figure 9.)

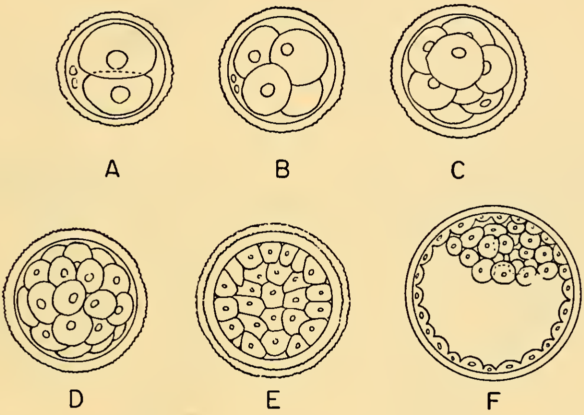

Figure 8. Early stages of cell division. After Van Beneden.

Up to and including the stage during which the embryonic disc develops, it is possible for the formative cells to group themselves in such a way that monozygotic[3] twins will result. What causes this to happen is not understood. Some embryologists suggest that it may be brought about, in some cases, by a slowing up of the process of cell division.

However caused, monozygotic twinning alters the circumstances of prenatal and postnatal life. It involves sharing the uterus and having a more cramped prenatal environment than the single born. It also involves sharing the time and attention of family members after birth and spending at least the first years of life in close association with

[3] Monozygotic twins develop from one zygote or fertilized sex cell.

another individual of the same age. The effect this may have on behavior is suggested in studies of language development which show twins to be behind singletons in some measures of speech development.

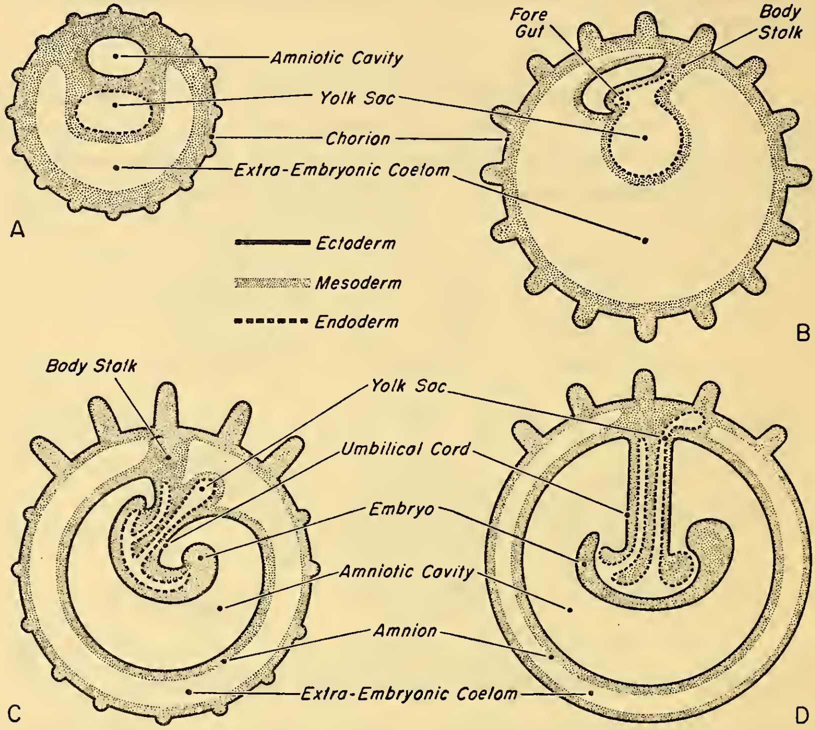

Figure 9. Stages in cell differentiation leading to development of the embryo and membranes. From J. P. McMurrich, *Embryology*, 1920. Blakiston Division, McGraw-Hill Book Co.

Other multiple births which are the result of two or more female sex cells *each* being fertilized by a male sex cell also lead to a shared uterine environment, a sharing of family attention and a close relationship with another individual of the same age. In the event of there being only two offspring in such a multiple birth they are referred to as fraternal or dizygotic twins. Actually they are litter mates. They have shared a uterus but not a common genetic inheritance, hence their inherited characteristics are no more alike than those of brothers and sisters. In contrast, monozygotic or "true" twins developed from the same fertilized sex cell have identical inherited characteristics and are often so alike they can hardly be told apart.

At the time, therefore, of conception or within two weeks following it, the circumstances of an individual's life may be modified by his

becoming a member of a plural pregnancy. This happens in about 1 per cent of human pregnancies.

From the three kinds of cells represented in the three cell type or trilaminar stage of cell division and differentiation (shown in Figure 9) all the organs and tissues of the body are derived. For example, from the outer layer (ectoderm), the skin, sense organs, and nervous system develop; from the inner layer (endoderm), the digestive glands and lungs are formed; and from the middle layer (mesoderm), the muscles, bones, blood and blood vessels.

How do such different tissues as bone and blood develop from what was originally a single cell? The most reasonable explanation is, that, following division, different cells have different environments and different rates of development. Some cells, for example, are outside, some are inside, some are more crowded than others, and some are dividing at a faster rate. Evidence of a rather technical nature now indicates that the characteristics a cell develops are related to its rate of development or metabolic rate and to the biochemical influence of the cells that surround it. In interesting analogy, we shall see later that the behavior characteristics a child develops are also related to his rate of development and to the influence of the individuals that surround him. But, to return to the cells.

The Early Stages of Organ and Tissue Development

A third critical period in the life history of an individual occurs during the early stages of development of tissues and body organs from the three types of cells already mentioned. What makes these early stages critical is that they are the most vulnerable ones in an organ's development.

To illustrate the kind of relationship that exists between an organ's susceptibility to injury and its stage of development, German measels or rubella occurring in the first two months of pregnancy results almost invariably in cataracts, deafness, or other defects in the infant, but these conditions are not produced if rubella occurs in the later months. As the first two months cover the period of early differentiation of the eyes and ears, it seems likely that each organ and tissue passes through a critical period in development during which it is most susceptible to environmental influences.

Recent work on animals confirms this conjecture. In breeding rats it was found (Nelson, 1952) that a dietary deficiency (of pteroylglutamic acid) instituted 9 days after breeding invariably resulted in stillborn litters. When this deficiency was induced on the eleventh day,

95 per cent of the animals littered live young with multiple congenital abnormalities. When deferred to the twelfth or thirteenth day, 100 per cent of the animals littered live young with much milder degress of abnormality. Normal young resulted when the deficiency was not induced until 15 days after breeding.

Thus we see in prenatal as we shall see again in postnatal development that the influence of environmental factors on an organism is related to the stage of development of the organism. We can see too that *by the end of the second month of prenatal life, chance and environmental circumstances have already played a part in the destiny of a human being, determining some of the congenital characteristics which will help or hinder him in his interactions with his environment.*

Environmental factors continue to play such a part during the entire period of prenatal development. But before considering how they operate, it will be helpful to review briefly the environmental characteristics of prenatal life as contrasted with those of life after birth.

Environmental Characteristics of Prenatal Life

Though sheltered within its mother's body and cushioned from jars and pressures by the amniotic fluid which fills the amniotic sac (Figures 10 and 11), the fetus is far from secure in its environment. At least one conception in five ends in abortion, and there are, as we

CONTRASTING CHARACTERISTICS OF PRENATAL AND POSTNATAL LIFE

	Prenatal Life	*Postnatal Life*
Physical Environment	Fluid (amniotic fluid)	Gaseous (air)
External Temperature	Roughly constant temperature	Temperature fluctuates with atmospheric conditions
Sensory Stimulation	Sensory stimulation other than kinesthetic or vibratory stimuli at a minimum	All sense modalities stimulated by a variety of stimuli
Nutrition	Hemotrophic, dependent on nutrients in mother's blood	Dependent on availability of food and functioning of the digestive tract
Oxygen Supply	Oxygen passes from maternal to fetal blood stream at the placental surface	Oxygen passes from lung surface to newborn's pulmonary blood vessels
Elimination of products of metabolism	Discharged into mother's blood stream	Eliminated by lungs, skin, and kidneys

Figure 11. An embryo of an estimated age of eight weeks. From M. E. Davis and C. E. Scheckler, *DeLee's Obstetrics for Nurses,* 1957. Published by W. B. Saunders Company. By permission of the author and publisher.

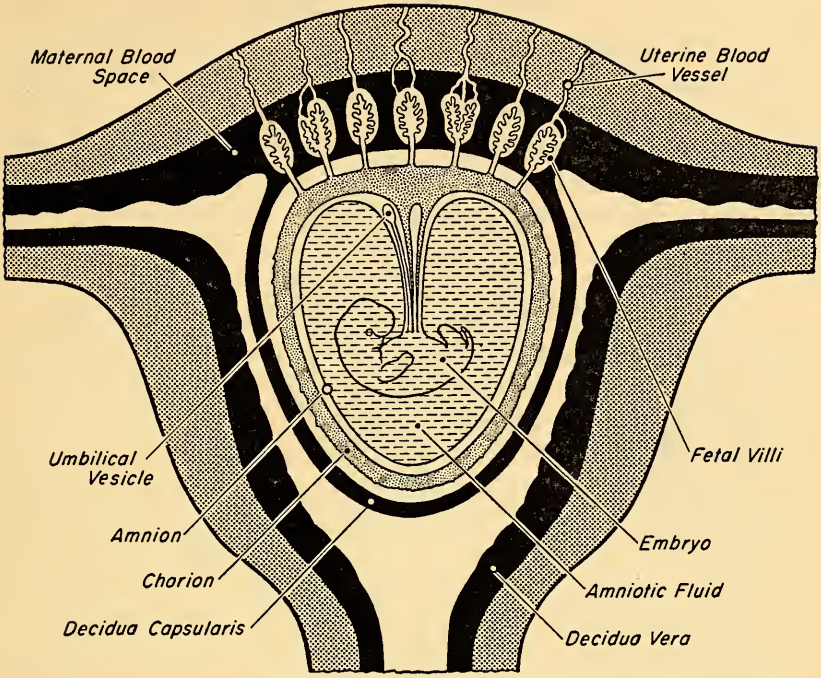

Figure 10. Relation of uterus, membranes, and embryo during early pregnancy. From L. Carmichael, "Origin and Prenatal Growth of Behavior," in C. Murchisen (Ed.), *A Handbook of Child Psychology*, 2nd ed. Worcester: Clark University Press, 1933. By permission of the publisher.

shall see later, a variety of circumstances (some as removed as low parental income) which indirectly but adversely affect fetal development.

Prenatal life is thus no less hazardous than postnatal life. It is, though, as the summary below shows, more similar for all fetuses than the postnatal environment can ever be for different individuals.

Though similar, intrauterine life is nevertheless not the same for all fetuses.

Differences in Intrauterine Environments Which May Affect Prenatal Development in Ways Reflected in Behavior After Birth

Duration of Intrauterine Life

Intrauterine life is of variable duration. The extent of its variability is indicated in Figure 12 below which shows the distribu-

tion of 3,275 male and female births in England according to the length of the mother's pregnancy (Karn, 1947).

Though the average length of pregnancy recorded (calculated from the first day of the last menstral period) is 279 days with two thirds of the births taking place within two weeks plus or minus this number of days, there is a range from 195 to 350 days, which suggests that prenatal life for some infants may be less than seven months and

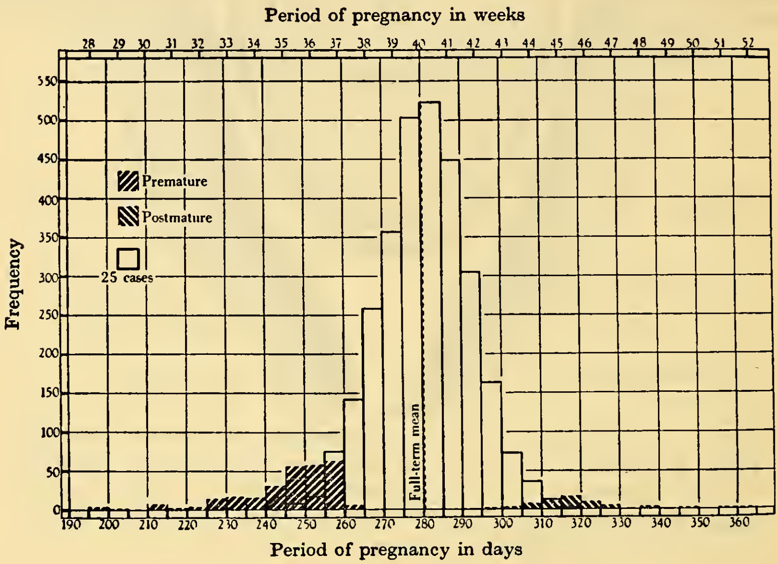

Figure 12. Distribution of 3,275 male and female births according to period of mothers' pregnancy. From M. N. Karn, "Length of Gestation with Special Reference to Prematurity," *Annals of Eugenics,* 1947, *14,* 49. By permission of the author.

for others considerably more than nine months. How much more cannot be stated exactly as the length of time that *can* elapse between the first day of a woman's menstrual period and conception is not as yet reliably established.

How is variability in the duration of gestation periods accounted for? Disregarding for the moment gestation periods that are prematurely terminated because of some pathological condition, there is a partial answer to the variability in normal pregnancies in observations made on cattle.

Variability in Duration of Normal Pregnancies

It has been found, for example, that Aberdeen Angus cows have a different average length of gestation from Hereford cows when each

breed is carrying a pure-bred calf. Both Aberdeen Angus and Hereford cows also have a different average length of gestation when purely mated than when crossmated (Rife, 1943). Though caution is necessary in applying research findings from one animal species to another, it would seem a reasonable conjecture that length of human gestation is, *in part*, an inherited characteristic of the fetus. This invites speculation as to whether early- and late-born infants may differ in their rate of development after birth, with the late-born continuing to be late developers.

In the graph above (Figure 12), premature and postmature births classified on the basis of duration of pregnancy, birth weight, and other clinical evidence are shaded in, showing that three times as many births are premature as postmature. Evidence from other sources, suggests that about 5 per cent of all births are premature, which prompts the question of whether premature birth or the circumstances associated with it have any bearing on a young child's behavior. The answer to this question is that this depends on *how premature* the birth is and on *what caused* or *contributed* to the premature birth.

To illustrate, as prematurity is related to birth weight, infants weighing under 3 pounds probably represent a different developmental sample from those weighing between three and five pounds, and presumably face greater developmental hazards in an extrauterine environment. Evidence that this actually is the case is to be found in the incidence of blindness in prematures weighing under 3 pounds at birth (Terry, 1945, Eames, 1946). In the case of these very premature infants, blindness is associated with the method of oxygen administration following birth. It appears that medical science has so far made greater progress in insuring the survival of early prematures than in providing the extrauterine conditions necessary for their normal development. *Generalizations concerning prematurity must therefore be made in terms of birth weight and other indications of maturity, and in terms of postnatal care received.*

Generalizations concerning prematurity must also be made in terms of the contributory causes of prematurity.

Variability in Duration of Pregnancies That Are Accompanied by Unfavorable Health and/or Economic Circumstances

Though some premature births may result from individual genetic variations or multiple pregnancies, others are associated with such conditions as maternal toxemia, infection, malnutrition, or substandard living conditions. In a study made at Cincinnati General Hospital (Brown, 1946, a.b.c.), the percentage of premature births in 2,018

mothers with normal pregnancies was 5; in 1,311 mothers with toxemia, 38 per cent, and in 411 mothers with acute infections, 15 per cent. In reports from Scotland (Baird, 1945) on the incidence of prematurity in different social and economic classes, the percentage of premature births in a lower income group is double that in a group with higher social and economic standing.

Therefore, until we have studies which have been carefully designed with regard to degree of prematurity, contributing factors in prematurity, and kinds of nursing care received during the first weeks of postnatal life, the only generalization we can make is that newborn prematures have somewhat different constitutional and developmental characteristics from mature infants. These different characteristics elicit a different kind of caretaking response which, in turn, conceivably has some effect on the premature infants' development of behavior.

Mothers' Nutrition

Another intrauterine variable is the mother's nutrition. The old adage about 'eating for two,' though often incorrectly applied, is sound in its implication that what a mother eats affects the health and development of her unborn child, as well as her own. Though maternal and fetal blood circulations are separate, nutritive elements diffuse through the semi-permeable membranes which separate them.

Evidence that *what* diffuses through these membranes has some effect on fetal development is presented in investigations that compare the diets of mothers during pregnancy with the condition of their offspring at birth. In one such study (Burke, 1943 a,b, 1949), diet ratings and protein intake of pregnant women are compared with the pediatric rating and length and weight of their infants at birth. In another (Sontag, 1947) the protein intake of pregnant women is compared with the length, weight, and skeletal ossification of their infants at birth. A third study (Ebbs, 1941) offers comparisons for three groups of women whose diets represent different degrees of adequacy in terms of National Research Council of Nutrition recommendations. Group comparisons are in terms of the condition of infants at birth and during the first six months of life. Group comparisons are also offered of the mothers' pregnancy ratings (made by an obstetrician), length of labor, and ability to lactate. Table 1 summarizes the kind of data and results obtained.

Briefly it was found that the adequacy of a mother's diet, in particular the adequacy of her protein intake, is related to the condition

TABLE 1

THREE STUDIES OF INFLUENCE OF PRENATAL DIET ON MOTHER AND/OR INFANT

Author *Date*	*Subjects* (*sample*)	*Information* (*Data*) *Mothers*	*Infants*	*Results* *Mothers*	*Infants*
Burke, B. S. et al 1943 1949	216 mothers, 284 infants Boston Lying in Hospital Prenatal clinic. Low income, only 5% over $50 weekly.	Dietary rating in grams protein based on diet records kept each trimester of pregnancy.	Mortality & morbidity rate. Pediatric rating at birth & first two weeks. Weight & length at birth.	10% 85 gms. protein 22% 70–84 " " 30% 55–69 " " 24% 45–54 " " 14% less 45 " "	Diet excellent—95% infants rated excellent or good. Diet poor—8% infants excellent or good. r between infant's length and mother's protein intake = .80. Infant's length & weight increased for each increase protein.
Ebbs, J. H. et al 1941 1942	380 mothers (without disease) and infants. Toronto General Hosp. 120 low income, poor diet, given dietary advice. 170 fair income and diet, given dietary advice. 90 low income; diet supplemented to meet adequate standards from 6th month pregnancy to 5 weeks after birth.	History of previous pregnancies. Dietary estimates at 6 mos. pregnant and at 4–6 weeks before confinement. Obstetric rating, length labor, ability to nurse 6 weeks after birth.	Mortality & morbidity. Pediatric rating. Birth weight.	Twice as many cases anemia toxemia, uterine & breast infections, & threatened miscarriage and many more miscarriages, still births, premature births, in poor diet group. Six weeks after birth 59% poor group nursed infants 86% supplemented group nursed.	More illnesses in babies in poor diet groups. 3 deaths in first 6 months.
Sontag, L. W. et al 1947	205 mothers & infants upper middle class no illness during pregnancy. Volunteered cooperation in Fels Research Institute.	gms. protein intake estimated from diet records.	Birth lengths & weights. Skeletal ossification.	10% 85 gms. protein 41% 70–85 " " 38% 55–70 " " 10% 45–55 " " 1% under 45 " "	Relationships for weight & length & protein intake of mothers positive but not significant.

of her infant at birth and to the infant's health during the first six months of life. The adequacy of a mother's diet is also related to the state of her health during pregnancy, to her ability to carry an infant to term and to breast feed it. As protein foods are expensive ones, it is not surprising that the adequacy of mothers' diets is also related to the adequacy of the family income.

Investigations such as these, which show a fairly high incidence of inadequate diets in low-income groups, suggest that inadequate maternal diet is probably the most frequently encountered hazard of intrauterine life. It affects, not only the infant's health and well being at birth, but also his mother's introduction to motherhood. Each of these circumstances may affect the infant's subsequent development of behavior in ways that will be discussed in a later chapter. Meanwhile it is obvious that the relationships demonstrated between family income and maternal diet, and between family income and uterine environment, pose a social problem in infant and maternal welfare to which there is no simple solution.

Other prenatal conditions that may be unfavorable to fetal development, and may therefore possibly relate to later behavior, occur much less frequently than inadequate maternal nutrition and premature birth. In less than 0.5 per cent of births, such conditions as malfunctioning of the mother's reproductive system, maternal infection, incompatibility of maternal and fetal blood types, and a cramped position in the uterus result in a variety of congenital abnormalities, which affect both the response an infant makes to his environment, and the response the environment makes to him.

Malfunctioning of the Mother's Reproductive System

In an estimated two to three births per thousand in the United States a mongolian idiot is born. The term *mongolian* is used to describe the characteristic appearance of the upper eyelids in this type of mentally defective child. Until recently the birth of such a child was regarded, at least by parents, as an act of fate. Now it seems likely that it *may* sometimes be the result of malfunctioning of the mother's reproductive system due to inadequate endocrine stimulation.

As evidence to support such a likelihood, mongoloids occur most frequently in pregnancies in which there is some indication of endocrine inadequacy. For example in one analysis of fifty cases, most of the women bearing mongoloids were found to have histories of menopausal symptoms prior to pregnancy, or of ovarian abnormal-

ities, threatened abortions, impaired hormone regulation, menstrual irregularities or difficulties in becoming pregnant (Benda, 1949). In other analyses, incidence of mongolism was found to increase with age of mother at pregnancy and to be forty times greater in women who had borne one mongoloid than in those who had not (Benda, 1946).

There is of course also evidence that some older women and some women with histories of inadequate endocrine functioning bear normal infants. Therefore what we need now are comparative percentages of mongoloid *and normal* infants born to mothers with different pregnancy histories.

Another manifestation of inadequacy of the hormonal environment of the fetus is the incidence of newborn cretins or congenital hypothyroids. Cretins occur in an estimated two per ten thousand births in the United States (Benda, 1946). The causative mechanism of cretinism is not definitely established. A deficiency of the thyroid hormone, thyroxine, in the maternal blood in the early stages of pregnancy or of iodine at a later stage when the thyroid has begun to function could contribute to this condition.

Maternal Infections

It has long been common knowledge that syphilis can be transmitted from a mother to her unborn child and that congenital syphilis may result in stillbirth, premature birth, blindness, or other abnormalities. There are also cases in medical literature of prenatal infection with viruses (smallpox, measles, and chicken-pox) and with bacteria (typhoid). A more recent discovery is that rubella (German measles) occurring in the early part of pregnancy may lead to widespread damage of the embryo or fetus.

Following a severe epidemic of German measles in Australia in 1940, it was observed (Gregg, 1941) that there were several cases of congenital cataracts in infants whose mothers had suffered from rubella during pregnancy. A later check on the infants of all mothers who were known to have had rubella during pregnancy (Swan, 1946) revealed congenital abnormalities in approximately 90 per cent of the infants whose mothers suffered from this disease in the first two or three months of pregnancy. Infants whose mothers suffered from this disease in the last months of pregnancy were not affected in this way.

The diversity of abnormalities including deaf mutism, cardiac lesions, and microcephaly is explained by the early stage of embry-

onic development at which the infection occurred. At this stage several organs are in process of differentiation and hence are susceptible to injury.

Why was a relationship between rubella contracted during pregnancy and congenital abnormalities not noted until 1940? The reason may be that the rubella organism reached a new level of virulence during the epidemic in Australia. Whatever the explanation, it is evident that if some maternal infections occur in periods of pregnancy that are critical for their transference and effect on embryonic and fetal cells, this may add a variable, of very low incidence, to the intrauterine environment.

Incompatibility of Maternal and Fetal Blood Types

In an estimated two to three births per thousand, a mother who has a different Rh blood type from her fetus may develop antibodies in her blood to a level critical for the developing fetus. These antibodies diffuse through the placental membrane into the fetal circulation and cause destruction of the fetal red corpuscles—edema and jaundice. (See Figure 13.)

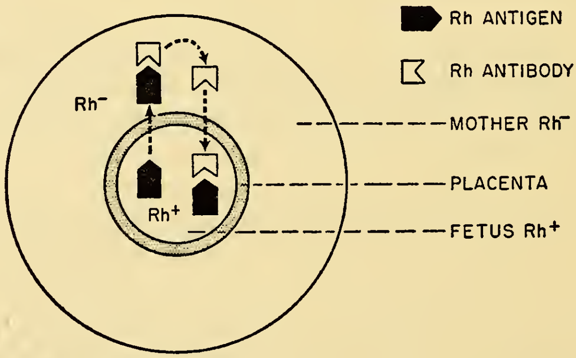

Figure 13. Reaction of mothers to incompatible Rh of fetus. From Curt Stern, *Principles of Human Genetics*. San Francisco: W. H. Freeman and Company, 1949. By permission of the publisher.

Rh blood types were first discovered in 1940 when it was found that blood serum of a rabbit immunized against the serum of a rhesus monkey agglutinated the red blood cells of some human beings.

It is now known that Rh blood type in human beings is an inherited characteristic which may be dominant or recessive in function. Two parents carrying different Rh factors in their genes may thus produce a child of different Rh blood type from his mother. When

this happens the mother *may* in an estimated 2.5 per cent of cases develop antibodies or agglutinins, which diffuse through the placental membrane and cause destruction of fetal blood cells.

This occurs in some cases in which mother and infant are of different blood type and not in others; perhaps because some mothers tend to develop a defective placenta which permits diffusion of blood cells or serum from the fetal circulation to the mother's blood, and of antibodies from the mother's serum to the fetus. The reason may also be that successive pregnancies or transfusions with blood of a different Rh type may raise the level of antibodies in the mother's blood to a critical point. In mothers with only one pregnancy, in which different maternal and fetal blood types occur, this point may not be reached.

In the medical supervision of pregnancies in which mother and fetus have different blood types, periodic checks on the level of antibodies in the maternal blood indicate whether remedial measures need be undertaken to safeguard the fetus. Such measures include inducing labor before term and giving the infant an exchange transfusion. To illustrate, a newborn infant with Rh+ blood who is suffering from antibodies developed by his Rh− mother has some of his blood withdrawn and replaced by Rh− blood from a doner who has had no opportunities, as the result of pregnancy or transfusions, to develop Rh+ antibodies.

Cramped Fetal Position in the Uterus

As there is less than a quart of amniotic fluid in the amnion in which the fetus lies, it is clear that prenatal living conditions are somewhat cramped. Recent evidence (Chapple, 1950) suggests that the fetus may accommodate himself to the pressures of his cramped quarters by relaxing his posture. Excessive relaxation of his hip ligaments may, in rare cases, result. In such cases the hip bones may fail to ossify because the thigh bone has not been pulled in sufficiently to produce the pressure necessary to stimulate ossification of the hip socket. This leads to a congenital cartilaginous dislocated hip which requires remedial care after birth.

Fetal injury, resulting from a cramped position in the uterus, incompatability of maternal and fetal blood type, maternal infection, and malfunctioning of the mother's reproductive system occurs in less than 0.5 per cent of all births. That it occurs at all is a reminder that behavior may be modified by prenatal as well as postnatal environmental circumstances. The relationship between infants' condition at birth and their mothers' diet and living circumstances during

pregnancy is likewise a reminder that information concerning a mother's pregnancy may throw light on some aspects of her child's behavior.

Kinds of Behavior Which Develop Before Birth and Their Relationship to the Functioning of the Nervous System

BEHAVIOR develops before birth; at this period, however, it is behavior in the biological rather than the social sense. It is manifested in 'spontaneous' movements, which are the result of unknown internal stimuli, and in responses to mechanical and electrical stimuli administered by investigators.

These movements and responses are of interest to some one seeking understanding of the everyday behavior of boys and girls because they offer clues to the ways in which behavior develops. They are also related to the level of functioning of the nervous system. The functioning of the nervous system is, in turn, related to its stage of organic development. It is therefore worth reviewing briefly some of the essential features of prenatal development of the nervous system before considering what is known about the prenatal development of behavior.

Prenatal Development of the Nervous System

The nervous system has its source in a thickened band of ectoderm (the neural plate) extending along the mid-dorsal line of the embryo. Unequal growth in the margins and central area of this plate produces a depression (the neural groove) with two ridges or folds (the neural folds). Continuing development results in deepening of the groove and thickening of the folds, which eventually fuse. The neural plate is thus rolled into a neural tube, under the surface of the ectoderm, and detached from it (see Figure 14). Growth of the tube proceeds more rapidly in the anterior end, which becomes enlarged and constricted at two points to define three primary areas of the developing brain—the forebrain, midbrain, and hindbrain (see Figure 15).

The rate at which this nervous tissue develops during the prenatal period is relatively rapid compared with that of other body tissues. This is reflected in the weight of the brain at birth; 11 per cent of total

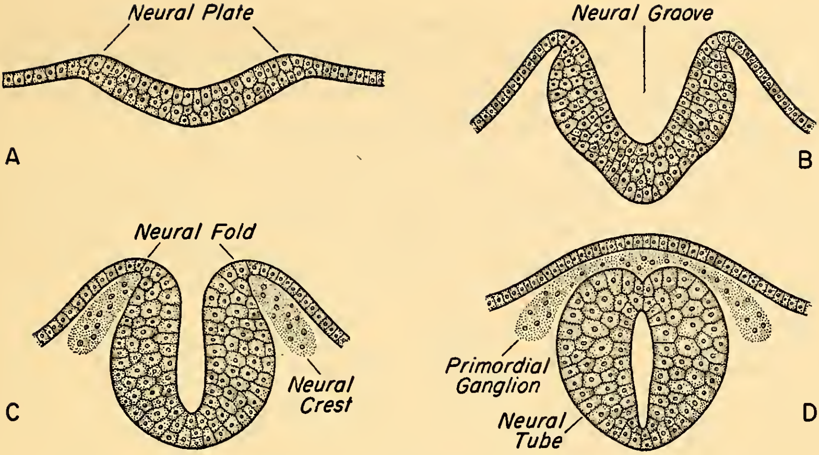

Figure 14. Development of the neural tube. From L. B. Arey, *Developmental Anatomy*, Saunders and Company, 1946. By permission of the publisher.

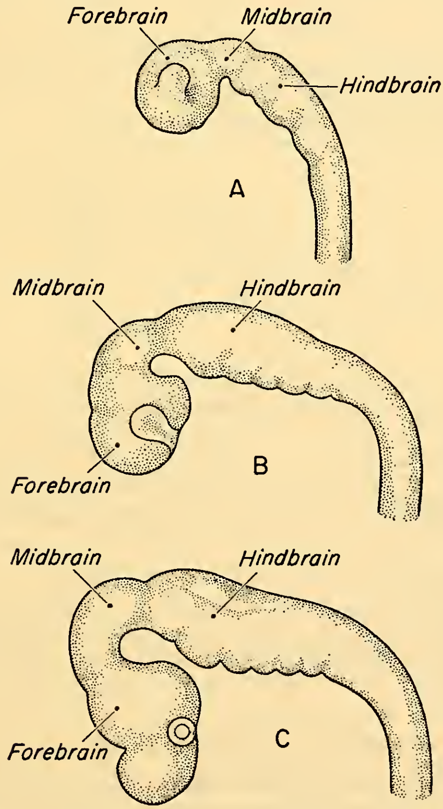

Figure 15. Early stages in the development of the brain. From B. M. Patten, *Human Embryology*, Blakiston's Div., McGraw-Hill Book Co. 1952.

weight, compared with 2.5 per cent in adulthood. The relatively rapid rate of development of the brain is also reflected in comparative head-length ratios and cranium-face proportions of two-months-old fetuses, newborn infants, and adults (Figures 16 and 17).

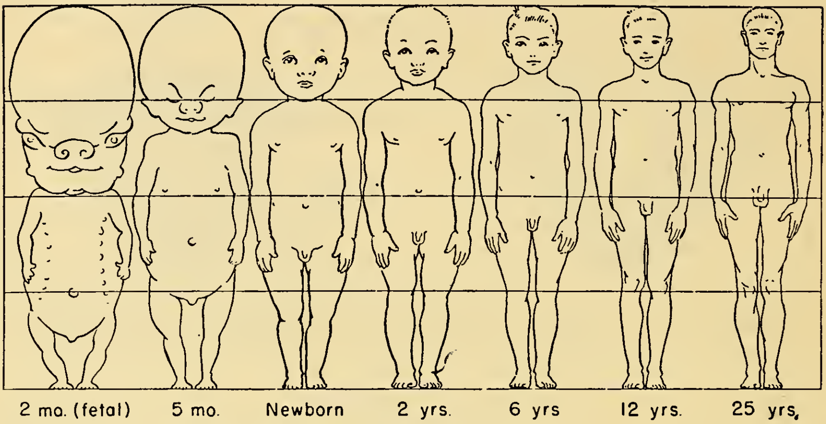

Figure 16. Changes in bodily proportions with age. Adapted from Robbins, Brodie, Hogan, Jackson, and Greene, in *Growth.* Copyright 1928 by Yale University Press. New Haven.

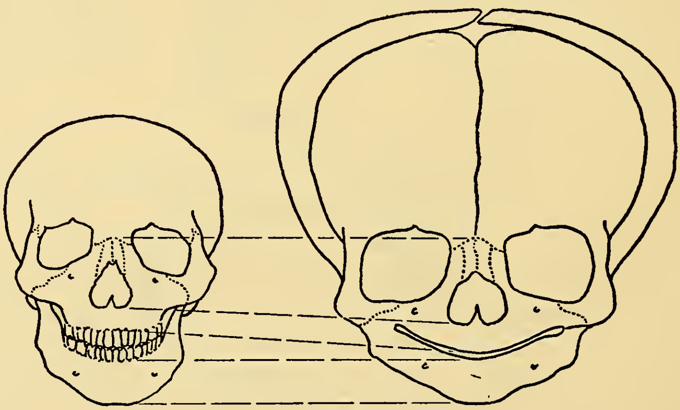

Figure 17. Changes in facial proportions with age. From C. M. Jackson (Ed.), *Morris' Human Anatomy.* Copyright 1923 by Blakiston Division, McGraw-Hill Book Co. By permission of the publisher.

The part of the brain which leads in rate of development is the forebrain from which the cerebral hemispheres or cerebrum develop. The outer cellular layers of the cerebrum, called the cortex, are the part of the brain whose level of functioning distinguishes man from lower animals. The cortex is concerned with associative processes,

with memory, learning, reasoning, and all that we include under a definition of intelligence.

Though development of the cerebrum is a dominant feature of fetal development, there is evidence from several sources that at birth the cortex may have little functioning capacity. Some of this evidence is morphological, some histological, and some is derived from electroencephalograms which are recordings of the electrical activity of the cells of the cerebrum (see Figure 18).

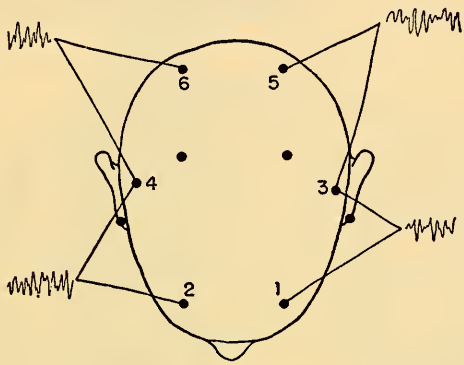

Figure 18. Placement of electrodes in obtaining an electroencephalogram.

Morphologically, the surface of the brain is smooth until the middle of fetal life, and only gradually develops the deep fissures and shallower depressions which increase and define its functional cellular areas (see Figure 19).

Histologically, the cerebrum is composed of the outer layers of nerve cells already referred to (called the cortex) and an inner central area of nerve fibers leading from the nerve cells. Both cells and fibers are surrounded by supporting tissues, and in adulthood the majority of the fibers are encased in a fatty sheath of myelin (see Figure 20). At birth this process has not yet taken place.

This lack of myelination is not the only histological evidence of immaturity of the newborn's brain. Other criteria on which estimates of cortical maturity are based are texture (the newborn's brain is gelatinous [or, if the newborn is premature, the consistency of junket]; the brain of later life is firm in texture); width and pattern of the cortex; size, shape, and number of cortical cells; and size, length, and number of cell processes, such as axons and dendrites (Conel, 1939).

Encephalograms of the newborn support the histological evidence of cortical immaturity (Hughes, 1948). Thus Figure 21, which contrasts electroencephalograms of a child at different ages, shows that the

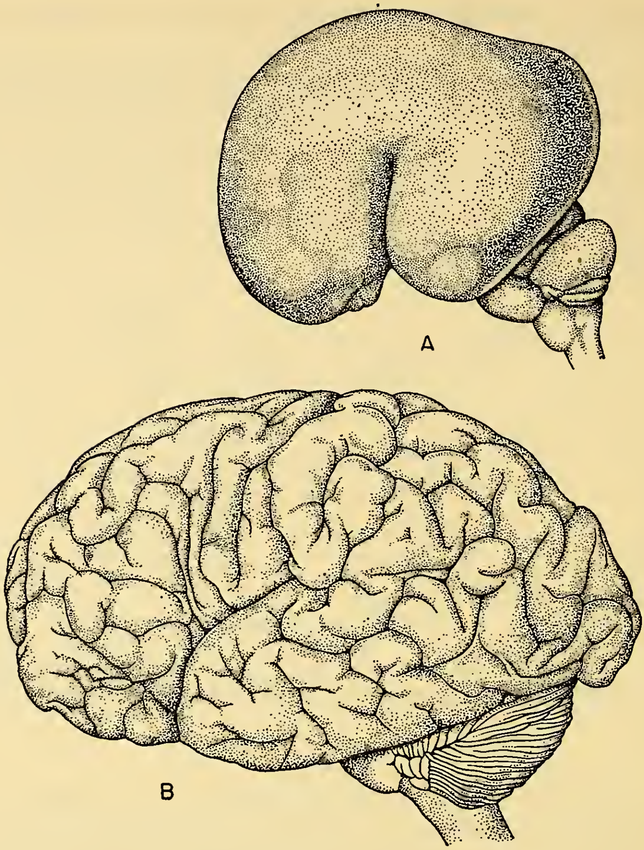

Figure 19. Changes in the external appearance of the brain from the early fetal period until birth. (A) The brain of a fetus aged four months. (B) The brain of a newborn infant from the same position as A. (After Retzius) From N. L. Munn, *Psychological Development.* Houghton Mifflin Co., The Riverside Press, 1938. By permission of the author and publisher.

waves recorded for the newborn are of a very low amplitude and have no sustained rhythm.

While the cortical area of the brain remains structurally and functionally immature during prenatal life, infra-cortical areas and the spinal cord mature earlier, showing more myelination and other histological evidence of greater maturity at birth.

The relationship of myelination to development of behavior has so far not been definitely established. There is evidence of some specific behavior response to stimuli before all nerve fibres concerned have acquired a myelin sheath. There is also evidence that in an animal

species the extent of myelination at birth is related to its behavior repertoire. For instance in the calf, which walks at birth, there is a level of myelination in the motor cortex comparable to that of the human infant at eighteen months.

Other evidence which suggests a relationship between myelination and behavior is that all pathways concerned with fundamental vital activities are myelinated by the end of the seventh fetal month.

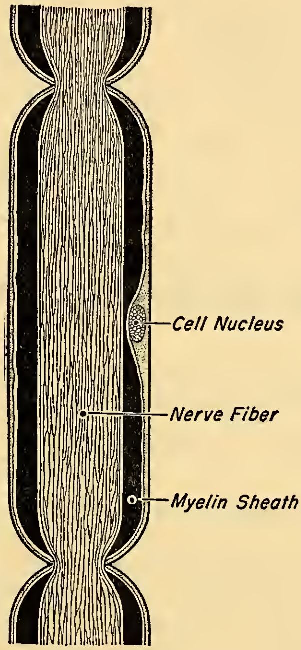

Figure 20. Myelinated nerve fibers.

In prenatal life then, the functional immaturity of the cerebral cortex, and the more advanced development of the subcortical areas of the brain and spinal cord, indicate that fetal behavior is under subcortical control. Since subcortical mediation of behavior is associated with a "built-in" stereotyped pattern of response to stimuli, and since incomplete myelination of the central nervous system is associated with lack of coordination, one would expect fetal motor activity to be diffuse, generalized, and incoordinate in character. One would also expect that any stimulus-response patterns of behavior which could be elicited would be of a set reflex type.

Behavior expectations based on the maturity of the nervous system accord well, as we shall see, with behavior actually observed.

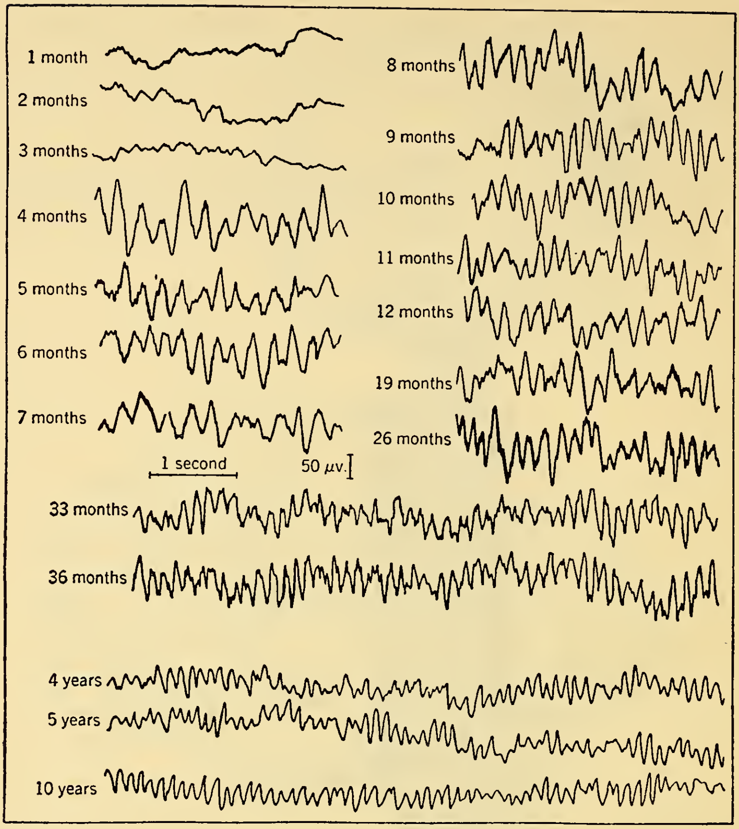

Figure 21. Electroencephalograms of the same child at different ages. The occipital alpha rhythm first appears at about three or four months of age at a frequency of about three or four per second and increases to about five or six per second at one year of age and to about ten per second at ten years of age. The above sequences, from the same child, show this development of the alpha rhythm as a function of age. By courtesy of Professor Donald B. Lindsley, Department of Psychology, University of California, Los Angeles.

Sources of Information Concerning Prenatal Behavior

Information concerning the prenatal development of behavior is obtained from three sources: studies of animal fetuses, studies of human fetuses operatively removed from the uterus, and studies of human fetuses in utero.

Studies of Animal Fetuses

Studies of animal fetuses contribute to our understanding of the early development of human behavior because all animal embryos are

fairly similar during the early stages of development (Figure 22). Generalizations developed for one species such as the fish, whose embryo can be observed through its translucent egg covering, therefore have *some* relevance for other species whose embryos are less accessible to study, such as human beings. Further, as different animal

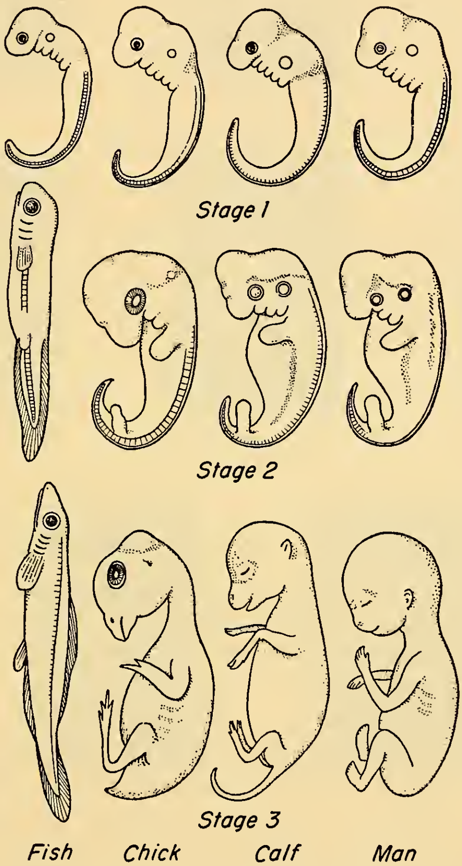

Figure 22. Similarities in structure in various embryos at three comparable and progressive stages of development. From G. J. Romanes, *Darwin and After Darwin.* Vol. I, *The Darwinian Theory.* Chicago: Open Court, 1896.

species have different prenatal environments and different levels of maturity at birth, observations and generalizations can also be made concerning relationships between development of behavior and characteristics of the prenatal environment, and between development of behavior and maturity of the nervous system.

Studies of Human Fetuses Operatively Removed from the Uterus

As for the studies on human fetuses, two (Minkowski, 1921, and Hooker, 1943) were made on fetuses operatively removed from the uterus. These fetuses, which were of an estimated age of two to five months, were available for study because there were therapeutic reasons for terminating their mothers' pregnancy. Following delivery by Caesarean section, each fetus was placed in a physiological salt solution at about 90° F. The placenta was placed in an adjacent container and supplied with oxygen under pressure. Despite these efforts to maintain temperature and oxygen supply the fetuses in both studies were progressively cooling and asphyxiating while under observation. In the brief period during which they remained alive, stenographic and cinematic records were made of their spontaneous behavior and of their responses to electrical and mechanical stimuli applied to different parts of their bodies (Figure 23). The strength of tactile stimuli was held constant by using human or horse hairs (tipped with a bead of duco cement) which were calibrated in terms of the milligrams of pressure they exerted when maximally bent.

Studies of the Behavior of Human Fetuses in Utero

In addition to the information obtained from operative studies, information of a sort has always been available from mothers' reports of fetal movement. Recent systematic studies have made such information more reliable and objective by the use of a variety of instruments which magnify or record fetal movements (Sontag, 1933), and by control of the conditions under which mothers report fetal activity.

Instruments attached to the mother's abdominal wall for recording fetal activity are the cardiograph which registers graphically the intensity and duration of heart movements, the phonocardiograph which amplifies heart sounds, the electro-encephalograph, and an apparatus for recording fetal movement. Devices used by the mothers in recording simultaneously their own and their fetus's activity include a series of push buttons attached by a recording system to a polygraph.

The most comprehensive study in the United States of fetal behavior in utero is that conducted at the Fels Research Institute at Yellow Springs, Ohio. In this project, three hundred children and their families are the subjects of a comprehensive longitudinal study, concerned with the part environmental factors play in the development of behavior. As part of this study, mothers reported to the Institute at regular intervals during pregnancy and recorded fetal activity by the push button system described above, under different conditions of

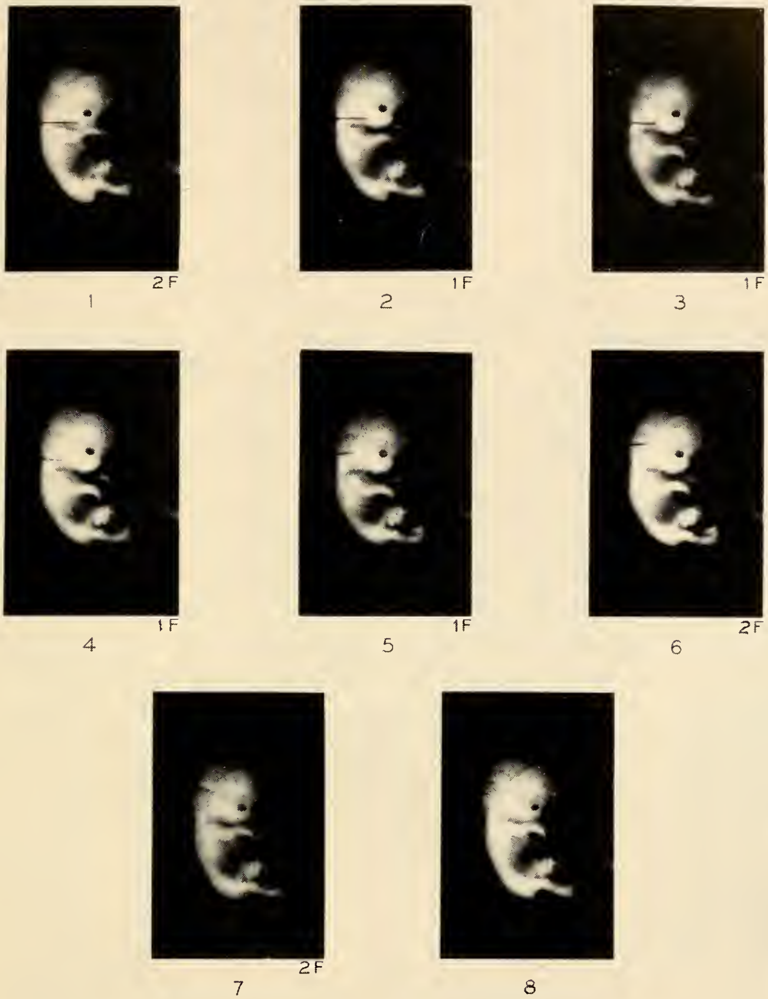

Figure 23. Fetus responding to stimulation by a hair of 25 mg pressure value. From D. Hooker, *A Preliminary Atlas of Early Human Fetal Activity*, 1939. Reproduced by permission of the author.

maternal activity. These conditions included resting after exercise, eating, smoking, and reading in a quiet room or in quiet interrupted by sudden sounds.

Information Obtained from Studies of Prenatal Behavior

As a result of the studies of behavior made on fetuses either operatively removed from or still in the uterus, some generalizations can be made about the early development of such kinds of behavior as spontaneous movement and response to mechanical or electrical stimulation. Generalizations can also be made about the frequency and character of fetal movements in utero and about relationships between fetal activity and maternal states of rest, fatigue, or emotional stress, and between fetal activity and behavior characteristics after birth.

The Development of Spontaneous Movement and Response to Mechanical or Electrical Stimulation

Table 2 summarizes briefly some of the major findings reported in the studies of fetuses operatively removed from the uterus. In the original reports, behavior is recorded in terms of the crown rump length of the fetuses. The age estimates here are approximations based on length measurements and information concerning the dates of the mothers' last menstrual period.

Generalizations concerning the development of behavior in human prenatal life which appear warranted from these investigations are:

Development of behavior in prenatal life follows an orderly course. Hooker states that activities at a given stage of development proved to be so uniform that he was able to predict the age of a fetus accurately from its behavior.

Responses to stimuli develop from a generalized stereotyped response to an infinite variety and combination of delicate discrete responses.

Generalized mass activity and massive responses to stimuli occur at a period when some discrete reflex responses can also be obtained. This suggests that behavior develops as the result both of (a) integration of individual specific acts into a complex pattern of response and (b) emergence of specific individual acts from a generalized stereotyped response. These contrasting processes which both contribute to the development of behavior are generally referred to as *integration* and *individuation.*

Responsiveness to stimuli shows a tendency to develop in an

TABLE 2

OPERATIVE STUDIES OF BEHAVIOR OF HUMAN FETUSES

Investigators	Minkowski	Hooker
Published reports	1920–1928	1936–1943
Number fetuses	75	65
Estimated ages	Second to fifth month, inclusive	7–25 weeks menstrual age
Crown rump length	15–280 mm.	16–220 mm.
Earliest movement recorded in youngest fetuses	Heart Beat (independent muscle contraction)	
Spontaneous movement. Age of onset and character	At 8 weeks (30 mm.) slow worm like movements of arms, legs and trunk. At 9 weeks, slow, arythmic unsymmetrical noncoordinated movement. At 13½–14 weeks, much spontaneous activity described as "graceful and delicate."	
Response to stimuli (earliest type)	At 8–9 weeks mechanical and electrical stimuli produce muscle contraction. Response to local stimuli is accompanied by irradiation to other muscles. Response is obtained to direct muscle stimulation before true neuro-muscular action begins. "Every section of the skin can serve as a reflexogenous zone for extremely variable reactions which have a tendence to spread over entire fetal organism."	
Appearance of discrete reflexes	'With exception of respiration, grasp, use of the voice and special sense responses, the fetus at 13 to 14 weeks possesses in undeveloped form in many cases most of the basic reflexes of the new born.' By twenty-five weeks menstrual age, respiration, grasping, use of vocal chords and the suctorial reflex have developed (in response to stimulation of mouth and tongue).	
Response to stimulation of cerebral cortex	No response	
and medulla	Breathing changes	
De-cerebration	Did not change observable responses	
Responses to sensory stimuli *cutaneous* *temperature* *pain* *proprioceptive* *gustatory* *olfactory* *auditory* *visual*	Evidence that specialized skin and other senses have developed to an active functional state long before birth	

anterior-posterior direction from the face to the lower limbs, with the greatest sensitivity in the mouth area.

Behavior necessary for survival is ready to function well in advance of birth. Thus all reflexes essential to prenatal life appear at *about* the fifth month of fetal life. Similar evidence of advance preparation of behavior necessary for survival comes from other reports of fetal respiratory movements of the thorax beginning in the first half of pregnancy, and of fetal swallowing (of amniotic fluid), excretion of urine, and peristaltic movements of the gastrointestinal tract during the last three months of fetal life (Windle, 1940).

Individual and Developmental Differences in the Frequency and Character of Fetal Activity

There are wide individual differences in the frequency of fetal movements reported by mothers at approximately the same stage of pregnancy. There are also the following developmental differences:

Fetal activity increases as pregnancy advances, the peak being reached one month before birth (Richards, 1938a,b).

Three types of skeletal movement are discernible, a sharp kicking movement, a small rhythmic movement, called hiccups and a slow squirming movement.

The relative frequency of these different kinds of movements is related to the stage of pregnancy. Relatively kicking decreases and squirming increases as pregnancy advances (Newberry, 1941).

Relationships Between Fetal Activity and Maternal States of Rest, Fatigue, or Emotional Stress

Maternal fatigue and maternal emotion stimulate fetal activity (Sontag, 1935a, Schmeidler, 1941, Bernard, 1947). Increase in fetal activity is also associated with an increase in mother's basal metabolic rate (Richards, 1938a).

Fetal heart rate is similarly affected by the mother's smoking cigarettes. This response becomes more marked as pregnancy advances (Sontag, 1935b, 1936, 1938).

Relationships Between Extrauterine and Intrauterine Factors and Infant's Condition at Birth

There is some evidence that maternal emotional stress accompanied by increased fetal activity leads to a reduced birth weight and to irritable hyperactive infants with gastro-intestinal dysfunction (Sontag, 1940, 1944). There is also some evidence, involving only twelve cases, that infants reported by their mothers to be very active as fetuses were somewhat more advanced on motor-test items at six months of age than infants reported to be less active during the fetal period (Richards, 1938b).

In summary, studies of fetal behavior in utero make it clear that fetal activity and fetal heart rate are increased by maternal activities and feelings. Tentative relationships, established on small numbers of subjects, between postnatal behavior and prenatal activity or the environmental circumstances associated with prenatal activity suggest that early twentieth-century attitudes toward 'prenatal influences'

should be revised. In fact it would appear that after decades of disproving misconceptions that maternal impressions mark the unborn child, we may be on the threshold of discovering a much closer relationship between the physiology and functioning of the mother and her child than we previously thought existed.

The evidence available certainly points to the need for careful study of all factors, physiological and psychological as well as social and economic, that might conceivably affect development before birth. Such studies would contribute both to our understanding of development of behavior and to our appreciation of the need for preventive psychiatry during pregnancy. It may well be that popular concepts of obstetrical care, which have progressed during the first half of the century from medical supervision of parturition to medical supervision of all factors affecting the health of the mother and her unborn child during the entire course of pregnancy, will progress still further and include medical consideration for the mental health and emotional preparation for parenthood of the prospective parents.

Review

In the story of Sleeping Beauty, fairies at her christening, with a flourish of wands, announced their gifts of superior native endowment and social circumstances. Suppose two fairies, one an environmentalist and one an hereditarian wished to endow a child as yet unconceived, what circumstances would their incantations have to cover?

The first would be the genetic characteristics of the child's ancestors and the particular combination of these genetic characteristics which the child inherited. The second would be the parents' economic circumstances which would need to be adequate to insure a good diet for the child's mother, good housing, and good medical care. As a third, the environmentalist would favor sole occupancy of the uterus for nine months in a mother who was neither over 35 nor under 20 years and who had a well-functioning endocrine and reproductive system and an Rh blood type compatible with that of her husband. The environmentalist also would prescribe a bland pregnancy, unmarred by even minor infections in the early months and unattended by heavy manual labor or emotional stress in the later months.

With such incantations and with no counter-spells from the crabbed witch—chance—both fetus and mother might approach birth with hopeful expectations.

Recommended Reading

Students will find a brief readable account, by the investigators, of a study of fetal behavior in utero, and a study of behavior in operatively removed fetuses in *Readings in Child Psychology*, edited by Wayne Dennis (New York: Prentice-Hall, 1951): pp. 15–19, Bernard, J., and L. W. Sontag, "Fetal reactivity to sound"; pp. 1–14, Hooker, D., "The development of behavior in the human fetus."

Also of interest as a satire on a planned human society in which the planning extends to prenatal life is *Brave New World*, by Aldous Huxley (New York: Doubleday, Doran, 1932. New York and London: Harper & Bros., 1939), pp. 1–32.

Recommended Films

"Reproduction in higher forms of life" (Bray). Sound, 10 mins.
Presents with animated diagrams, the processes involved in reproduction in birds, reptiles, and human beings.

"Early human fetal behavior" (Hooker and Associates). Silent, 15 mins.

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Chapter 3

BEHAVIOR OF THE NEWBORN OR NEONATE

Does the use of anesthesia or type of delivery have any effect on behavior following birth?

What physiological adjustments does the infant have to make at birth?

Does the newborn infant see, hear, smell, taste, and feel pain, pressure, heat, and cold?

Why are newborn infants more active, more vocal, and more responsive at some times than others?

What is the behavior repertoire at birth of a full-term infant?

How soon does the newborn infant begin to learn as a result of his experiences?

What emotions does the newborn infant express? Can adults discern loneliness, sadness, fear, or anger in his behavior?

Are personality differences apparent in the first days of life?

What communication is possible between the newborn infant and the adults who care for him?

What are the difficulties in adapting a feeding schedule to the individual physiological needs of an infant during his first days of life?

Are there advantages in hospital "rooming in" over nursery care for the newborn during the first days of life?

BIRTH IS a milestone, not a point of origin. What makes behavior in the first days of life worthy of separate consideration is that birth marks the earliest point in an individual's existence at which both he and his behavior can be freely observed.

At birth, babies are different ages. They also have different past experiences: those of uterine life already referred to, and those of the birth process.

Birth Experience: Its Relationship to Behavior of the Newborn

As different infants have different kinds of birth experience it would be helpful to know what effect, if any, length of labor, force of uterine muscle contractions, type of birth presentation, use of forceps and anesthesia have on a baby's behavior during its first days of life. Unfortunately little information is available as few *carefully controlled* studies have been made.

The need for controlling all variables except the one on which comparisons of newborn behavior are based is well illustrated in a study (Ruja, 1948) of the relationship between length of labor and neonatal crying. This study attacks an interesting problem, but offers inconclusive evidence because the 66 newborn infants on whom records of crying were obtained were observed at different time intervals after birth ranging from the first to the eighth day. As crying increases during the first ten days of life (Pratt, 1930) any comparisons of crying in terms of length of labor must obviously be made on infants of the same age.

Though little information is now available concerning relationships between birth experience and newborn behavior, save in cases of specific birth injury, the electro-encephalograph may prove useful in exploring such relationships. To illustrate, a comparison of the electro-encephalograms of infants whose mothers either had or had not received sodium seconal during labor (Hughes, 1948a,b) revealed that those whose mothers had been given this drug registered

a striking depression in cortical cell activity, which was still evident in some of the babies' electro-encephalograms after clinical signs of drowsiness had disappeared.

In contrast to the undefined relationships between birth experience and early behavior, those between the anatomic and physiological characteristics of the newborn and his behavior are both obvious and basic to an understanding of his behavior.

Anatomic and Physiological Characteristics of the Newborn: Their Relationship to His Behavior

Before considering these relationships let us take a glance at a newborn infant who approximates the statistical average for the United States (see Figure 24).

Body Proportions of the Newborn

He (there are slightly more male than female births in the general population) has a head-to-heel length of approximately 20 inches, and a weight of approximately 7½ pounds. His head is disproportionately large, about one fourth his total length compared with one eighth of total length in adulthood, and may be slightly molded as a result of birth pressures, an effect which passes off within a few days. His face is relatively small and the cranium large compared with adult proportions and with early Italian painters' portrayals of the Christ Child in nativity scenes. Head circumference is approximately the same as that of the chest. Arms and legs are relatively short.

To get some idea of the part these body proportions play in the behavior of the newborn, consider for a moment the mechanical problems you would have in sitting up and holding this book if your head were about four times its present size and your legs and arms about half their present length.

Postural Adjustments of the Newborn

Placed on his back, the newborn flexes his arms and legs. He occasionally assumes an asymmetrical position a little like the

Figure 24. A four-day-old infant in prone and supine position.

stance of a fencer. In this position his head is rotated to one side; the arm and leg toward which the head turns are extended, and the other arm and leg are flexed. This is described as the 'tonic neck reflex' or t.n.r. and is the earliest manifestation of monolateral behavior, later apparent in left or right handedness and in eye and foot preferences. (See Figure 25.) Placed prone, the newborn's position

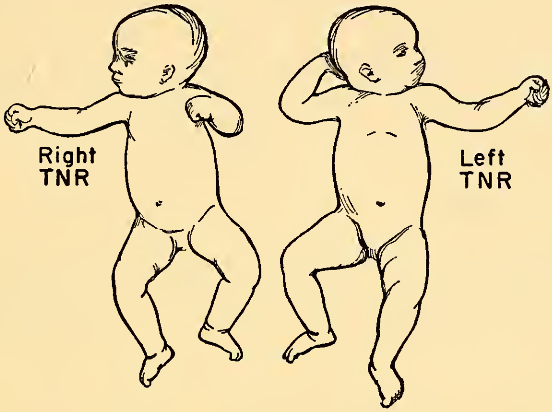

Figure 25. Right and left TNR. From A. Gesell, "The Ontogenesis of Infant Behavior," in L. Carmichael (Ed.), *Manual of Child Psychology*. John Wiley and Sons, Inc., 1954. By permission of the publisher.

of passive kneeling resembles that of a Moslem in prayer; the arms and legs are flexed and the head bent downward or averted. With such limited postural adjustments at his command the newborn is obviously handicapped in interacting with his physical environment. He is similarly handicapped by the amount of time he spends asleep.

Proportion of Time Spent Asleep

Awake, the newborn is in a state of continual movement of a diffuse general type. He is however seldom awake. It is estimated (Peiper, 1928, and Pratt, 1930) that he averages 20 out of the 24 hours asleep with unbroken sleep periods of about three hours. Though he is not completely immobile and unreactive while asleep, his mobility and reactivity are related to the depth of his sleep.

It is therefore reasonable to assume that he is somnolently out of range of most external stimuli most of the time during the first ten days of life.

Physiological Functioning of the Newborn

Physiological functioning as well as body proportions affect behavior in the first days of life. It is in fact impossible to discuss behavior during this period without reference to physiological functioning because the two are inseparable. The infant's physiological state at any one time is the source of most of his activity at that time and his responses to external stimuli are largely in terms of changes in the rate of such physiological functions as heart beat and breathing. In addition, in the first days of life, the infant is making physiological adjustments to a new environment.

Physiological Adjustments to a New Environment

At birth loss of a circulatory relationship with his mother threatens the new born infant with asphyxiation unless his lungs immediately take over the function of respiration. His first breath thus involves a change from a fetal to an adult type of circulation in which blood flows to his lungs instead of going to the placenta. Separation from a circulatory relationship with his mother also necessitates a change in type of alimentation. His gastro-intestinal tract must now take over the functions of ingestion, digestion, and elimination. Change in environment from a constant to a variable external temperature likewise makes new demands on the infant's regulatory mechanism for maintaining an approximately constant body temperature. The change in environment also changes the role of his senses. The skin receptors, the end organs for taste, smell, hearing, and vision, though developed to a functional level by the later weeks of prenatal life, are not activated until after birth. The first hours of life thus mark the beginning of sensory experience, an experience which James has described as a buzzing, booming confusion.

Though all of the adjustments described above have preparatory origin in prenatal life, they apparently increase the physiological stress of existence. There is, for instance, a loss of weight during the first three days of life which is not recovered until the tenth day. There is also a higher mortality rate during the first ten days of life than in any subsequent period of childhood.

Rate, Variability, and Responsiveness of Physiological Processes to External Stimuli

Physiological functioning of the newborn is not only an evolving adjustment to a different environment, it is also a more rapid and

variable process than that of later life. Heart and breathing rate for example are approximately twice that of adulthood (120 beats and 33 breaths per minute) and the eliminative process is correspondingly speeded up with defecation occurring on an average of 4–7 times and urination 18 times in 24 hours (Halverson, 1940, 1941). In addition, during the first days of life, physiological processes are more responsive to external stimuli such as sounds, light, pressure, touch, and changes in temperature. The effect on behavior of this responsiveness to stimuli is illustrated in infants' sucking activity. The newborn is so triggered to suck in response to a variety of stimuli that one of the distinguishing characteristics of his behavior is the "dominance of his sucking center."

Under such physiologically distracting circumstances as these, an individual of any age would be handicapped in paying selective attention or making discriminating responses to his environment. What of the newborn? Additionally handicapped by a functionally immature cerebral cortex and beset as he is by the urgency of survival, how does he behave?

Methods Used in Studying Behavior of Newborn Infants

Study of the behavior of newborn infants has probably been responsible for the development of more apparatus than study of behavior during any other period of early childhood. (Richards and Irwin, 1934.) This is due in part to the type of problems investigated and in part to the training and experience of the men who investigated the problems. The behavior they studied was behavior in the biological rather than the social sense. The problems they investigated were: the behavior exhibited by newborn infants under constant environmental conditions, the physiological, neuromuscular, and sensorimotor responses of infants to stimuli of known strength, and their responses to "conditioning." Such problems call for objective and quantitative recording of both stimuli and responses. These conditions were achieved or at least approximated through the development and use of such instruments as:

A stabilimeter which records the movements of an infant lying on it, over a string and pulley system to pens writing on a moving drum or polygraph (Benedict and Talbot, 1914). (See Figure 26.)

An observation cabinet, a box 5′ x 3′ x 4½′ containing instruments and devices necessary to control temperature, humidity, light, sound,

odor, and taste, and with a window through which the infant can be observed (Pratt, 1930). (See Figure 26.)

A facial mask and pressure register for measuring sucking movement (Jensen, 1932).

A pneumograph for measuring pulse changes at the fontanelles (Canestrini, 1913).

Balloons attached to a pressure-recording device for measuring hunger contractions in the stomach (Carlson, 1915).

Cameras for ultra-rapid motion pictures to facilitate analysis of behavior (Landis, 1937).

Sound recorders for preserving infant vocalizations for later analysis (Irwin, 1941a,b,c).

Electro-encephalographs for measuring changes in brain cell potential (Hughes, 1948a).

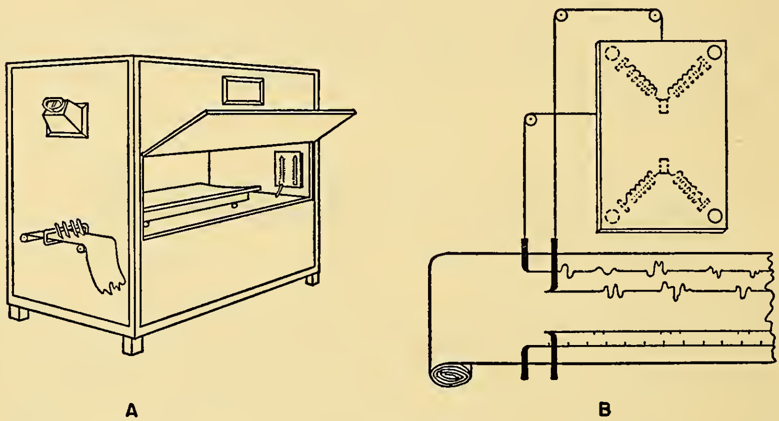

Figure 26. A. Observation cabinet and stabilimeter. B. Type of record obtained on polygraph. From J. F. Dashiell, *Fundamentals of General Psychology.* Houghton Mifflin Co., 1937. (Sketch is based on descriptions by Weiss and Pratt, Nelson and Son.)

Instrumental studies are, however, not the only sources of information on neonatal behavior. Observations of a naturalistic type are also offered in infant biographies and in reports of infant behavior under different conditions of nursing care.

Behavior of Newborn Infants

TURNING now to the results of studies made by various methods, a series investigating the kinds of behavior infants exhibit under conditions of constant environmental stimulation are of interest

in suggesting the part internal stimuli play in infants' activity, and the way in which behavior develops.

Behavior of the Newborn Under Constant Environmental Conditions

In one of a series of investigations (Irwin, 1930) begun at Ohio State University, four infants, each wearing an abdominal bandage and naval dressing, a diaper and a light undershirt, were placed, as soon after birth as possible, on a soft pad on the stabilimeter, in the experimental cabinet already described. For the first ten days of life, each of these infants was under continuous observation save for the periods when he was removed from the cabinet for feeding. A fifth infant served as a subject for preliminary development of techniques and testing of the apparatus.

Under these conditions two types of records were obtained: automatic pen recordings of oscillations on the polygraph tape caused by stabilimeter movement, and the experimenters' record on the polygraph tape of the frequency of segmental movements (movements of the head, arms, legs, and trunk). Before making this second type of record, the experimenters underwent a training period in observing and classifying all types of neonatal activity in a symbol code. The demanding nature of this training period, and the continuous observation it required, resulted in five miles of polygraph tape recording. It is therefore not surprising that only four infants were studied in this intensive way.

Results from this study are that infant activity was observed to wax and wane during each 24-hour period, apparently in response to the functioning of the infant's gastro-intestinal tract and urinogenital system. Infants, for example, were more active preceding feedings and urination. As further illustration, from another study in this series, involving 73 infants (Irwin, 1932), a correlation of $.97 \pm .04$ was obtained between general motility and time elapsed since last feeding.

The type of activity exhibited by the four infants was for the most part diffuse and generalized involving all parts of the body. Specific coordinated patterns occurred infrequently. When they did, they took such forms as sucking, alternate extension and flexion of the legs, and a characteristic sleeping posture in which the head is averted, the arms flexed with the forearms lying parallel to the head, and the legs slightly drawn up.

Crying occurred as an accompaniment to mass activity. Together

these two activities constituted the earliest form of social communication in that they elicited a social response. The experimenter in this study reports that when this behavior occurred even he was moved to abandon his function of observing and attend to the relief of the infant.

Factors influencing the frequency of infants' activity, other than gastro-intestinal and urinogenital functioning, were age and clothing. Both crying and mass activity increased during the first ten days of life and, in a study involving 50 newborn infants (Irwin, 1934), there was less crying and activity in clothed than unclothed infants, suggesting that clothing offers some insulation from atmospheric stimuli.

Studies of infant behavior under conditions of constant external stimulation reveal the part internal stimuli play in newborn behavior. Studies of infant responses to a variety of sensory stimuli likewise suggest the part external stimuli play in development of behavior. Such studies also give some indication of how well the newborn can see, hear, smell, taste, feel pain and pressure, heat and cold.

Behavior in Response to Sensory Stimulation

Investigations of responses of newborn infants to sensory stimuli demand precision in experimental procedure. Precision is necessary because little exact information can be obtained unless the characteristics of the stimuli, the state of receptivity of the infant at the time of testing, and the nature of his response are clearly defined.

Precision has therefore been sought by:

defining stimuli in exact quantitative terms as regards their intensity, duration, and other characteristics;

defining the state of receptivity of the infant—awake, asleep, hungry, fed, etc.—at the time a stimulus is given;

defining and measuring responses in terms of physiological reaction as well as changes in overt activity;

using a "control" period for comparison of behavior under conditions of nonstimulation;

comparing initial with later responses to continuing stimulation.

By way of illustration, Table 3 summarizes the specific types of controls used and the information available in studies of responses to visual stimuli.

In studying responses to other types of sensory stimuli, similar types of controls have been used and similar information obtained. Thus, in studies involving auditory stimuli (Pratt, 1934, Stubbs, 1934), an audiometer and oscillator were used to control the pitch and intensity of sound stimuli which were given under different conditions of light and darkness.

In studies involving taste or gustatory stimuli, solutions of known saturation were used in nursing bottles and the sucking responses of hungry and moderately full infants were recorded by a pressure-registering device attached to the bottle. Distilled water was used as the control solution (Pratt, 1930, Stirnimann, 1936, Jensen, 1932).

TABLE 3

SUMMARY OF CONDITIONS CONTROLLED AND RESPONSES MEASURED IN STUDYING INFANTS' RESPONSE TO VISUAL STIMULI

Visual stimuli characteristics	*Lighting conditions in period preceding stimulation*	*Physiological state of infant*	*Response* *Initial* *Later*
Intensity—foot candles	Intensity—foot candles	Awake or asleep	Respiratory response Circulatory response
Duration—seconds or minutes	Duration—seconds or minutes	Dry or wet	Activity (stabilimeter record) Reflex responses
Other characteristics: wave length movement of light spot projected vertically, horizontally, or in circular direction		Recently fed	Movement of head and eyes

In studies of infant responses to olfactory stimuli, an olfactory pump was used to direct a puff of air with measured vapor content toward the infant's face. A non-odorous puff of air was used as the control stimulus (Pratt, 1930, Stirnimann, 1936).

Reactions of different parts of the body to thermal stimuli were explored by using temperature cylinders, evaporating alcohol, radiant heat, distilled water of different temperatures dropped on the tongue, and nursing bottles with milk at different temperatures (Pratt, 1930, Jensen, 1932, Stirniman, 1939).

Responses to contact pressure and pain were compared in infants

asleep and awake, hungry, and in various stages of nursing (Pratt, 1937, Sherman, 1925).

The results obtained from these studies suggest that the newborn infant can see light and dark, but not color. Its lack of visual experience suggests that binocular vision is not developed. It hears sounds, but doesn't discriminate pitch differences. It responds to temperature changes above and below critical thresholds with a sensitivity that depends on the parts of the body stimulated (there is greatest sensitivity in the mouth area); it shows a developing discrimination between sweet and other solutions, but gives less conclusive evidence of sensitivity to smells. It is extremely sensitive to contact and pressure stimuli. These along with visual and taste stimuli seem to be the most effective external determiners of behavior. Sensitivity to pain appears to be related to the anatomical area stimulated and to the age of the newborn, but area and age differences are not yet convincingly established. Sensitivity to all stimuli is affected by their intensity and duration and by the infant's physiological condition at the time of stimulation.

For example, intense light or sound stimuli of short duration each produce changes in breathing and pulse rate and a startle response whereas a continuing sound stimulus leads to a quieting down and reduction of activity. The effect of preceding or accompanying conditions of stimulation is shown by greater sensitivity to light stimuli following a period of adaption to dark, and by greater reduction of activity to a continuing sound stimulus in the light than in the dark. As for the effect of the infant's physiological condition on his response, greater sensitivity is shown to touch and pressure stimuli in waking than in sleeping states. A hungry infant is a worse discriminator of taste than a moderately full one, and a nursing infant is less disturbed by mild electrical stimuli than one who is awake and between feeding periods.

The relatively unspecific character of responses to sensory stimuli—sucking, for instance, may occur in response to light, sound, and odorous stimuli—supports neurological observations of the greater immaturity of the sensory than the motor neural mechanism (Conel, 1939) and the later medullation of the sensory than the motor nerve fibers (Langworthy, 1933).

Despite the relatively undiscriminating character of his responses to sensory stimuli and his dominant concern with getting food at frequent intervals, it is obvious that the newborn is neither unaware of his environmental circumstances nor indifferent to the services he receives. In fact, his sensitivity to touch and pressure, his developing taste discrimination, and his quieting under the lulling influence of a

repetitive sound offer clues to the kinds of nursing care he appears to appreciate.

Responses to sensory stimuli and behavior under conditions of constant external stimulation are only part of the behavior repertoire of the newborn.

Behavior Repertoire

Though a complete inventory of the behavior of full-term infants at birth has so far not been made, a summary of items included in infant biographies has been compiled (Dennis, 1934).

The summary includes the following categories of responses. The term *response* is used because some of the behavior occurs to a variety of stimuli.

eyelid responses	neck responses
pupillary responses	head and arm responses
ocular responses	trunk reactions
tear secretion	foot and leg responses
facial and mouth responses	coordinate position of many parts
throat responses	

This list of categories makes it clear that there is much more to behavior at birth than occasional squirming, squalling, and sucking. There are in fact some specific patterns of behavior in newborn infants that are of particular interest both because they suggest the evolutionary origin of some early human behavior and because they undergo later modifications which suggest a relationship between development of behavior and development of functioning capacity of the brain.

Specific Patterns of Behavior That Suggest the Evolutionary Origin of Some Early Forms of Behavior

Examples of such patterns of behavior are the grasp suspension reflex which is a grip response, strong enough to suspend the infant's weight when a rod or finger is placed in his palm; the startle or Moro reflex, which is an arching of the back, throwing back the head and arms, and clutching in response to jarring; and the swimming reflex (Figure 27), which, as its name suggests, is swimming movements of the arms and legs when the infant is placed

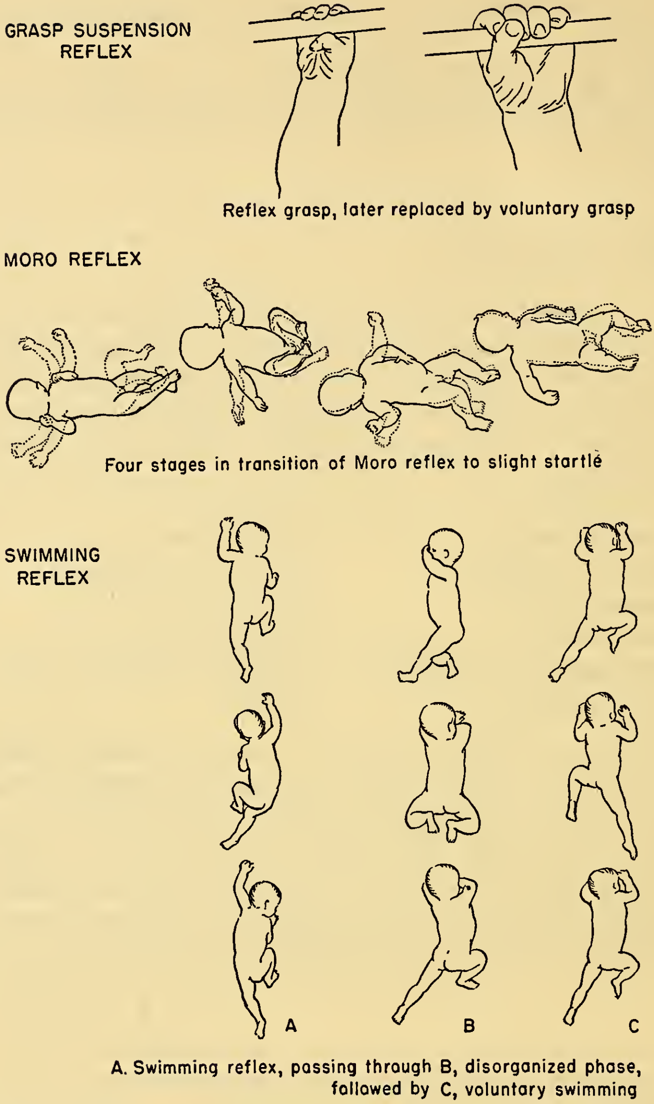

Figure 27. The grasp suspension, Moro reflex, and swimming reflex, and their later modification. From M. B. McGraw, *The Neuromuscular Maturation of the Human Infant.* Columbia University Press, 1943. By permission of the publisher.

in water. As these descriptions and the illustrations in Figure 27 suggest, the Moro and the grasp suspension would be better suited to an arboreal existence while the swimming reflex would seem more in keeping with an aquatic one.

Later Modification of Newborn Patterns of Behavior Which Suggest a Relationship Between Development of Behavior and Development of Functioning Capacity of the Brain

The changes the behavior patterns illustrated in Figure 27 undergo in the weeks following birth have been analyzed by plotting the frequency with which they occur in a number of infants at different ages (McGraw, 1943). As Figure 28 shows, initial behavior patterns first become more pronounced and then decrease in intensity. The Moro is later replaced by a slight body startle, the grasp suspension by voluntary grasping, and the swimming reflex by voluntary swimming movements.

It is suggested (McGraw, 1943) on the basis of this behavioral evidence and of what is known of the maturity of different parts of the brain at birth that these reflexes are, at birth, under subcortical control, and that the period during which the reflexes become more pronounced reflects further maturation of the subcortical area. The phase of progressive decrease and disorganization of the response shown by the swimming responses is attributed to the onset of cortical activity. Later the smooth functioning of a voluntary behavior pattern is seen as evidence of cortical control and of cortical inhibition of the original subcortical response.

Other behavioral patterns present at birth pass through similar phases, suggesting a change in functioning of the underlying neural mechanism. Among them are postural reflexes and reflex responses to stroking the sole of the foot. When the disappearance of these early patterns of response and the appearance of their later modifications is delayed, the infant's behavior on test items also presents a retarded picture (Bayley, 1933). When infantile responses appear in later life, they are an indication of neurological disturbance.

This evidence of a relationship between the functioning capacity of the brain and the kind of behavior present at birth may perhaps become meaningful if considered in terms of a widely employed analogy in which the nervous system is likened to a telephone system. Extending this analogy we might consider the first days and weeks of life as ones in which an emergency switchboard is functioning. This switchboard handles in a routine way urgent calls concerned for the most part with maintaining vital processes. Only gradually does the master switchboard with its vast number of way stations

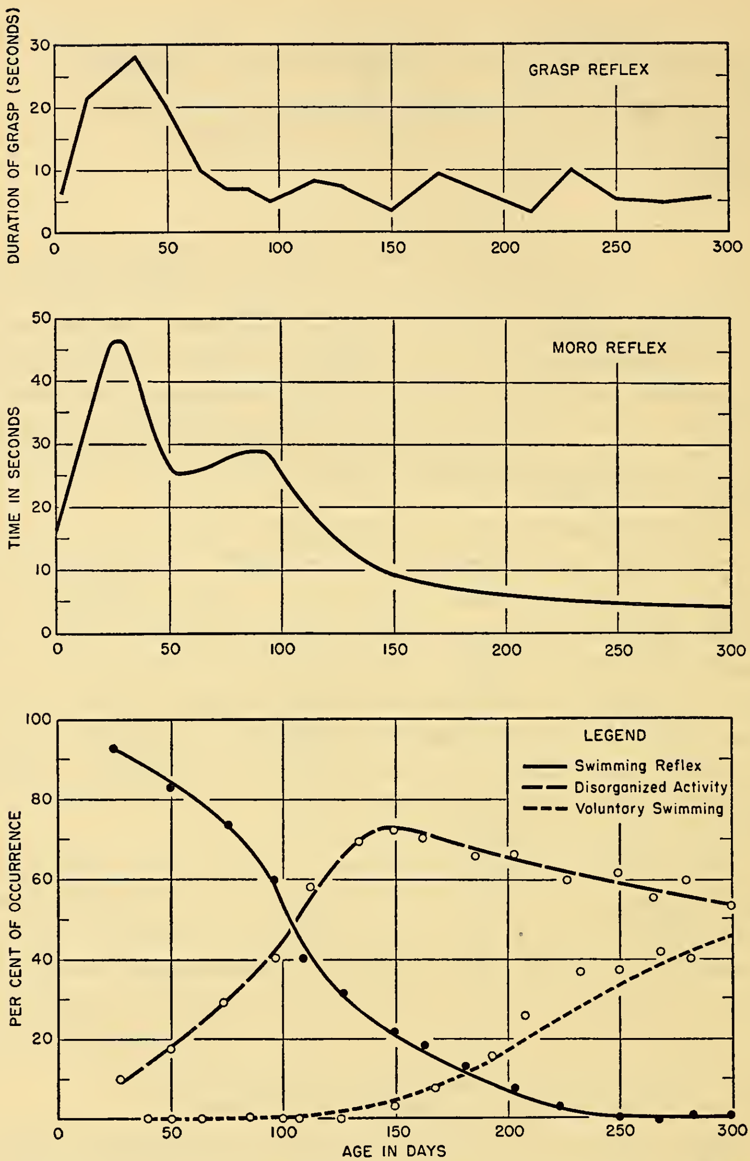

Figure 28. Incidence of grasp, Moro reflex, and swimming reflex at different ages. From M. B. McGraw, *The Neuromuscular Maturation of the Human Infant.* Columbia University Press, 1943. By permission of the publisher.

and exchanges come into smooth operation, making possible the diversity of adaptive and complex responses of later life.

Once born, an infant is subjected to a variety of stimuli. These give him an opportunity to learn something about the world he lives in. But can he learn?

Learning During the First Ten Days of Life

Several investigations of changes in neonatal behavior as the result of experience suggest that learning in a simple form begins in the first week of life.

One group of studies, summarized in Table 4, investigated newborn infants' responses to experimental conditioning. The problem in each study was to determine whether infants learned to associate a neutral stimulus with one which produced a specific response. Evidence of learning was revealed in the infants' giving the specific response to the neutral stimulus.

For example, in one study (Marquis, 1931) infants learned to suck in response to the sound of a buzzer after repeated training periods in which the buzzer was always sounded five seconds before a nipple was inserted in each infant's mouth. In another (Wenger, 1936), some infants learned to close their eyes to tactual vibration of the sole of the foot, following repeated experiences in which the sole of the foot was stimulated three seconds before a light was flashed in the infant's eyes. In another series of experiments (Wenger, 1936), withdrawal of the foot was learned by some infants in response to a sound stimulus and to a flash of light. During the training period, each of these stimuli was administered directly preceding a mild electric-shock stimulus.

In four out of the five studies, responses of the small experimental groups of infants were compared with control groups. While differences between these small groups are not large, they are consistent. They suggest that some infants learn a conditioned response to some stimuli during the neonatal period. However, in the experimental situations in which these studies were made, learned responses were very difficult to establish and very unstable.

Evidence of learning under more natural conditions is offered in a study of infants' responses to a change in their feeding schedule (Marquis, 1941). In this study a record was kept of the amount of general activity of three groups of infants between feedings. One of the groups was on a three-hour schedule, one on a four-hour, and one on a self-demand schedule in which feedings were given whenever infants behaved as if they were hungry. The infants' activity was mechanically recorded on a polygraph by a device attached to the spring supports of their bassinets.

Activity scores for each infant were based on the number of thirty-second intervals in which the recording device was activated. Comparisons between groups were then made in terms of the average

TABLE 4

INVESTIGATIONS OF CONDITIONING IN THE NEWBORN

Investigator	*Native Stimulus Response*	*Associated Stimulus*	*Population Sample*	*Data*	*Results*
Marquis, D. P. 1931	Sucking to nipple insertion	Buzzer sounded 5 seconds before inserting nipple	8 infants exp. 4 " control tested with buzzer alone	Polygraph records of chin movement	7 of 8 infants showed increase in mouth activity and decrease in general activity not obtained in control infants.
Wenger, M. A. 1936	Lid closure to 100 or 200 watt light flash	Tactual vibration at sole of foot for 3.4 secs. 3 secs before light flash	3 infants exp. 6 " control	Lid closure to vibrator stimulation on 2–9 day for exp. and control group	Lid closure greater than chance expectancy—showed individual differences and was unstable for experimental group.
"	Withdrawal of foot to electro tactual stimulus (shock)	Tactual vibration over sternum	1 infant	Foot withdrawal and accompanying responses to stimuli	On 9th day foot withdrawal in 43% stimulations, but only 14% and 12% on 7th and 5th day, hence evidence not unequivocably demonstrated.
"	Withdrawal of foot to electro tactual stimulus (shock)	Auditory stimulation by tone at 1084 cycles, 50 decibels	5 infants exp. 7 " control 4 " "	Foot withdrawal and accompanying responses to stimuli such as gasps for infants on 2–9 day	On 9th day slight response exp. 62% con. 28% full " " 30% " 10% gasps " 40% " 22% unstable conditioning in 3 subjects equivocal results in 2 subjects
"	"	Visual stimuli by 100 watt light flash	2 infants exp. 3 infants control	as above	On 9th day foot withdrawal exp. 46% con. 13% gasps " 61% " 9%

percentage of half-minute intervals in each ten minutes during which activity occurred.

Figure 29 shows the average activity scores obtained during the second to eighth day of life for infants on three- and four-hour schedules. In both groups there is a sharp drop in activity after nursing.

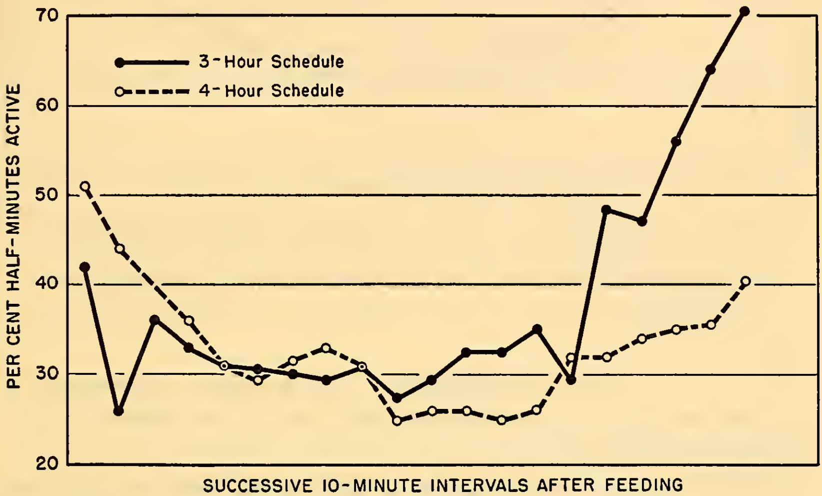

Figure 29. Comparison of activity between feedings of babies fed on a three-hour and a four-hour schedule. Adapted from D. P. Marquis, "Learning in the Neonate," *J. Exp. Psychol.*, 1941, *29,* 263–282.

The group on the four-hour schedule show a rise in activity again during the fourth hour, suggesting that some of them might have been better suited by an earlier feeding. In Figure 30 the results are shown of changing the group on the three-hour schedule to a four-hour schedule on the ninth day. Now this group show a much sharper rise in activity in the fourth hour than the babies who had eight days of experience with a four-hour schedule. The marked increase in activity accompanied by crying in the group with the changed schedule suggests that these babies had learned to expect food at a certain time and were protesting the change in service.

On the basis of studies such as this, it is tempting to conjecture the part that infant-care practices may play in developing attitudes to life. Certainly, it would seem reasonable to suppose that practices aimed at relieving physiological tensions as they arise would contribute to the infants' feeling of security and confidence in the hospitality of his parents. This in turn should contribute to an outgoing personality. However, Figures 29 and 30 suggest that babies on the four-hour schedule apparently learned to adapt to a schedule which their activity suggested might not have been their first choice. There-

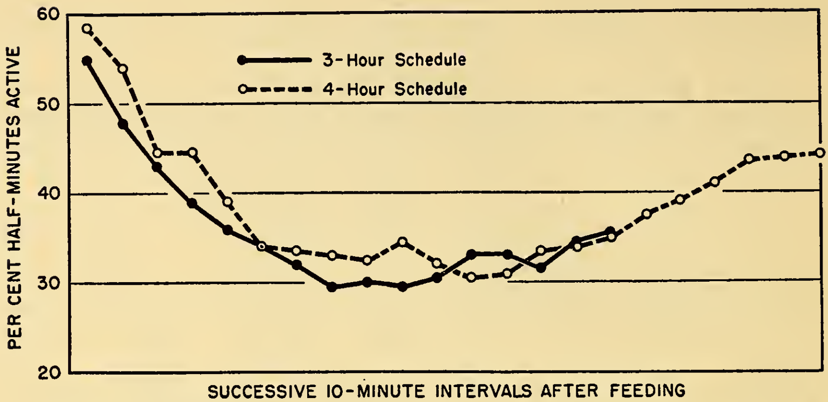

Figure 30. Comparison of activity between feedings of babies on a four-hour schedule and babies previously fed on a three-hour schedule but now changed to a four-hour schedule. Adapted from D. P. Marquis, "Learning in the Neonate," *J. Exp. Psychol.*, 1941, *29*, 263–282.

fore a more cautious generalization would be that *consistent practices lead to adaptation, inconsistent ones and abrupt changes to disorganization and distress.*

Infant responses to a change in feeding schedule suggest that the infants may have had some "feeling" about the change. Feelings, however, can only be inferred from behavior, and so it is of interest to know whether newborn infants exhibit behavior that can be readily classified as manifestations of anger, sorrow, fear, or some other emotional state.

Feelings or Emotions of the Newborn

A psychologist, John B. Watson, reporting in 1920 his observations on infant behavior, suggested that there were three specific emotions, which he defined in the stimulus-response terms summarized below.

Behavior Pattern	*Stimulus*	*Response*
Fear	Sudden loud noise Sudden loss of support, dropping from a height	Catching of the breath; clutching movements; crying
Anger	Restraint of movement of limbs and head	Slashing movements; crying
Love	Stroking or patting erogenous zones	Cooing; relaxing

Watson suggested that from these three specific emotional behavior patterns the whole complex emotional behavior of adulthood could be developed as the result of conditioning or association of stimuli. For example, an inborn fear of loud noises could lead to fear of creatures making loud noises.

Some years later another psychologist (Sherman, 1927a), tested the validity of Watson's observations and interpretations of neonatal behavior by asking groups of medical students, psychology graduate students, psychology instructors, nurses, and college freshmen to identify specific emotions expressed by infants under two weeks of age who had just received one of four stimuli. The stimuli given the infants were sudden dropping, restraint of the head and feet, pricking the face with a needle, and withholding feeding for fifteen minutes past the schedule time.

The group of adults were asked to identify emotions expressed when they saw

1) a film showing the stimulus and the response,
2) a film showing only the response,
3) a film in which stimulus and response had been transposed so that the response shown was not a response to the stimulus shown,
4) infants' responses to stimuli which had been administered behind a screen.

Under these circumstances individuals failed to identify emotions even when they saw both stimulus and response. They were even less successful when they saw only the response, and the answers given by a person appeared to be influenced by the nature of his training and interest. The nurses tended to associate crying behavior with hunger, the medical students with colic, and the psychology students and instructors tended to interpret behavior in terms of their knowledge of the stimulus.

A similar investigation (Sherman, 1927b) of identification of emotions on the basis of hearing infants cry gave similar results.

It appears therefore that specific patterns of emotional behavior cannot be reliably distinguished by independent observers of newborn infants. All that can be discerned is a general state of satisfaction or dissatisfaction with attendant circumstances reflected in quiescence or in heightened activity and crying. Out of these two general states of acceptance or rejection of stimuli the complex emotional responses of later life are elaborated.

If specific emotions cannot be identified in newborn infants, what of personality characteristics? Do newborn infants have individual

personality characteristics and if so, how enduring are these characteristics?

Personality Characteristics in Newborn Infants: Their Nature and Persistence

Several studies report wide individual differences in newborn infants' activity (Pratt, 1930), muscle tonicity (Balint, 1948a,b), irritability (Pratt, 1930) and crying behavior (Aldrich, 1945). Some of these characteristics are possibly related to the maturity and birth experience of the infant. Whatever their cause, it is reasonable to suppose that differences in such characteristics lead to differences in how the neonates are treated, which in turn have some determining or modifying effect on their personalities.

Evidence that such personality differences are identifiable during the first ten days of life and show some consistency during the period of childhood is offered in a study in which 25 infants were observed at frequent regular intervals during the first two years of life (Shirley, 1933). During this period the investigator noted considerable consistency in personality characteristics which she summarized in personality sketches of each infant. Fifteen years later these personality sketches were matched with personality sketches (based on ratings, tests, and interviews) made by another worker on the same children at 17 years of age (Neilon, 1948). The matching of sketches of 10 boys was undertaken by five judges, and that of 5 girls by ten judges. Both the matching scores of the individual judges and the mean scores of all judges were significantly greater than chance expectancy, though the scores were very low on some of the children. Some individuals, presumably those with greater uniqueness of personality pattern, were apparently more readily matched than others.

A possible factor in the persistence of personality traits noted in this study was the investigator's close association with the children's mothers and her observation of mother-child interaction during frequent regular home visits. Personality is a product of the interaction between an individual and his environment. Shirley, therefore, had an advantage in knowing a great deal about her children's interrelationship with their environment as well as about their behavior.

During the first days of life, a dominant factor in the newborn infant's interaction with his environment is, as has already been suggested, his constitutional characteristics. A weak, sickly infant or an overactive one obviously presents a somewhat different stimulus to

his mother from a sturdy vigorous baby or an inactive unreactive one.

The part the infant's constitutional characteristics play in mother-child interaction and the development of personality is therefore under study in several research centers. Though relationships between modes of mother-child interaction and development of personality are reserved for Chapter 12, it is worth noting at this point a refreshing change in emphasis from the mother's part in making or marring her child to the child's part in making his mother the kind of mother she is.

As all interaction involves communication of some sort, it is now pertinent to consider what communication is possible between newborn infants and the adults who care for them.

Irwin, in his study of infant behavior under conditions of constant external stimulation, suggested that mass activity accompanied by crying is the earliest behavior that can be considered social on the basis of eliciting a response from adults. But do adults know what response is appropriate?

Communication Between the Newborn and the Adults Who Care for Them

In 1944 four observers made continuous observations over an eight-day period of the crying of 50 newborn infants in a hospital nursery (Aldrich, 1945). Records made included the number of minutes each child cried, the times of day he cried, the possible reasons for his crying, the amount of nursing care he received, and the times at which he received the care.

The records showed that there were wide individual differences in the amount of time the infants cried, with a range of 48 to 243 minutes and an average of 117 minutes a day spent in crying. The reasons for crying, as interpreted by the observers were: hunger 36 per cent, unknown causes 35 per cent, wet diapers 21 per cent, soiled diapers 8 per cent, and vomiting 3 per cent. These percentages indicate that at least a third of the time the observers had no clue to the reason for infant's dissatisfaction with his circumstances. However, a comparison of the times crying occurred to the times nursing care was given showed that there was the most crying when the least nursing care was available—a period when the nurses were engaged in cleaning duties. There was also an average of 18 minutes a day less

crying in the children who were rated as good feeders than in the poor feeders.

The relationship between crying and nursing care was made even more clear by repeating the observations a year later when more care was available. At this time, each child received an average of 1.9 hours nursing care a day (in addition to time spent with his mother) compared with 0.7 hours in the earlier study. Infants also benefited from such modifications of hospital routine as changing the mothers' supper hour so that the infants' six o'clock feeding was not delayed, wrapping each baby in a cotton blanket to give him a feeling of close support, delegating cleaning service (performed a year earlier by the nurses) to a housemaid, and adding a student nurse to each shift to act as trouble shooter in investigating and relieving the cause of crying. Under these conditions, eighteen newborn infants observed cried an average of 55 minutes a day compared with 117 minutes in the previous year when less nursing care was available (see Figure 31).

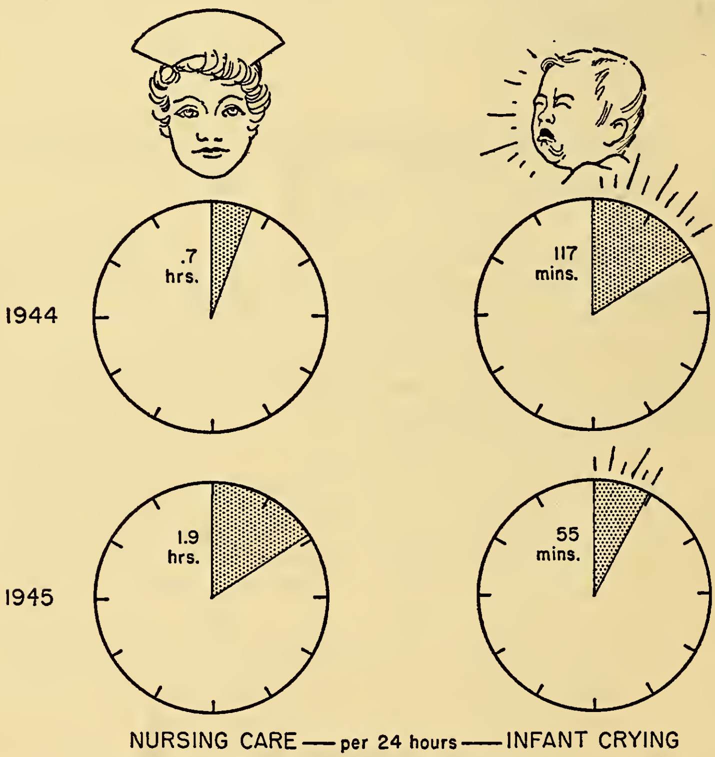

Figure 31. Relationship between nursing care and infant crying in a hospital nursery. Drawn from data presented in C. A. Aldrich, et al., "The Crying of Newly Born Babies," *J. Pediat.*, 1946, *28*, 665–670.

Figure 32. "Rooming in" arrangements in Kaiser Foundation Hospital, San Francisco. Reproduced by courtesy of Kaiser Foundation Hospitals.

Not only was there less crying, the various causes of crying changed in relative frequencies. In 1944, 36 per cent of the crying was interpreted as hunger and 35 per cent as unknown causes; in 1945, 53 per cent of the crying was interpreted as hunger, and 23 per cent as unknown causes. Either the observers (physicians and nurses) had become more sensitive in the interpretation of crying or the reduction in total time spent crying had been affected by making the infants generally more comfortable and so removing the unknown causes. However, even in 1945, there was still a relationship between the time of day crying occurred and the care available at that time, which seems to prove that the public likes service at all ages, regardless of whether it is capable of specifying the kind of service it would like.

Newborn infants' inability to specify the kind of service they want suggests an obvious difficulty in instituting "self-demand" feeding schedules in the first days of life. If the "self" concerned is incapable of communicating specific demands and if the self's attendants are incapable of interpreting the self's behavior, how can such a schedule be instituted?

The study reported above *suggests* that increased acquaintance with infants may lead to increased sensitivity in interpreting their behavior. Here then is an argument for hospital "rooming in" care of newborn infants. "Rooming in," which is essentially putting a newborn infant in the same room and within arms reach of his mother, gives her the maximum opportunity to get to know her infant. (See Figure 32.) This, in turn, should make her better able to interpret his behavior and hence to develop a feeding schedule suited to his particular needs.

This of course is not the only argument for rooming in. Others are the emotional satisfaction to the mother of having her infant alongside her, the reduction in hospital costs due to mothers giving infant care that would otherwise be the responsibility of a nurse, the instruction of mothers that is made possible through supervision of their infant care, and the promotion of breast feeding.

These arguments all sound plausible, particularly as rooming in arrangements generally allow a mother to have her infant removed from her care during periods when she feels the need for undisturbed rest. However, plausible arguments are not a substitute for empirical evidence obtained from carefully controlled investigation. Until we have such evidence we are not in a position to generalize about the relative merits of *different kinds* of rooming in and nursery service for *different kinds* of mothers with *different kinds* of infants in *different kinds* of hospitals.

In considering the merits of different kinds of hospital care, a

question naturally arises as to whether studies of newborn behavior offer any clues to the kind of care best suited to neonates.

Indications from Studies of Newborn Infants' Behavior of the Kind of Care Best Suited to Them

In Chapter 12 we shall see that many studies have been devoted to relationships between specific infant-care practices and personality. Though discussion of these studies is deferred until later, clues to satisfying infant care practices have already been offered. We have noted, for instance, that infants are sensitive to pressure and to intense stimuli of all kinds. We have also noted that fretful activity and crying are associated with hunger, changes in feeding schedule, limited nursing care, and lack of covering. These reactions suggest the kind of practices one would logically expect to produce "satisfaction" or "quiescence" on the part of an infant, whatever the subsequent effect on his personality. Such practices are gentle handling, close wrapped support, elimination of intense stimuli from the environment, efforts to determine cause of crying, and a consistent feeding schedule, whether based on a systematic three-hour feeding schedule or on systematic efforts to interpret infant behavior in terms of desire for food. Regardless of what relationship these practices bear to personality, they do seem to represent the standard of hospitality to which the newborn appreciates becoming accustomed.

In succeeding chapters we shall similarly note that the systematic study of young children's behavior helps us, not only in understanding young children and feeling more at home with them, but also in working more effectively with them.

Review

At birth babies are different ages. They also have different past experiences, those of uterine life and of the birth process. The relations of behavior at birth to intrauterine experience and to maturity at birth was suggested in Chapter 2; those between the birth process and behavior of the newborn are as yet not clearly defined. In contrast, the relationships of behavior to anatomical and physiological characteristics of the newborn are fairly obvious. His body proportions, and the limited number of positions he can assume as a result of his lack of neuromuscular coordination, make it difficult for

him to interact with his physical environment. The dominance of his physiological processes and the amount of time he spends asleep likewise handicap him in paying selective attention or making discriminating responses to external stimuli.

As the study of newborn behavior has been largely limited to laboratory investigations of "spontaneous" behavior under constant environmental conditions, of responses to physical stimuli, and of the results of "conditioning," considerable attention has been paid to developing methods and equipment that insure precision in measuring the characteristics of the stimuli administered and the responses obtained.

Behavior of newborn infants under constant environmental conditions suggests that the stimulus-source of most of their activity is the functioning of their gastro-intestinal tract and urinogenital system. The diffuse character of their activity under these conditions suggests that development of behavior is, in part, from a generalized to a more specific type of response. As for responses to external stimuli, there is evidence that the newborn sees, hears, tastes, feels pain, pressure, heat, and cold *to some extent.* His sensitivity is affected by the intensity and duration of the stimuli, by the environmental conditions under which they are administered, and by his physiological condition at the time of stimulation.

In the repertoire of neonate behavior patterns are some, such as reflex swimming and grasping, which suggest an evolutionary origin. The changes these and other patterns of behavior undergo as the infant matures appear to reflect a change from subcortical to cortical control of behavior.

Learning of a simple, unstable sort occurs during the first days of life, and it is surmised that the infant has "feelings" of some sort about his life circumstances. However, the only feelings so far identified are satisfaction (expressed by quiescence and relaxation), and dissatisfaction (expressed by heightened activity and crying). Newborn infants' level of activity and reactivity and their vigor and persistence in crying and nursing constitute distinguishing personality characteristics which presumably affect their interrelationships with the persons in their environment.

As only limited communication is possible between infants and adults, it is impossible to institute with "certainty" a regime of nursery care perfectly adapted to an infant's individual tastes or needs. However, since adult ability to interpret infant behavior improves with acquaintance, procedures that increase a mother's acquaintance with her infant should increase her ability to respond effectively to him.

The evidence available to date suggests that the kinds of adult

practices likely to find favor with newborn infants are gentle handling, close wrapped support, elimination of intense stimuli from the environment, efforts to determine cause of crying, and a consistent feeding schedule, whether based on a systematic three-hour feeding schedule or on systematic efforts to interpret infant behavior in terms of desire for food.

Recommended Reading

Abridged reports, by the investigators, of two studies of neonatal behavior under conditions of constant and varying external stimulation are to be found in *Readings in Child Psychology*, edited by Wayne Dennis (New York: Prentice-Hall, 1951): pp. 20–9, Irwin, O. C., "The distribution of activity between two nursing periods"; pp. 30–6, Irwin, O. C., and L. Weiss, "The effect of clothing on the general and vocal activity of the newborn infant."

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Chapter 4

MOTOR BEHAVIOR

Why are young children always "on the go" or always "into things"?

Does a baby "learn" to walk?

Will a baby walk earlier if he is encouraged and given special exercises and equipment?

Is early walking a sign of intelligence; is late walking a sign of mental retardation?

Should a left-handed child be changed?

Would you recommend a rhythm band as a developmentally appropriate undertaking for three-year-olds?

What practice conditions would you expect to improve young children's performance on particular motor skills, such as feeding and dressing themselves?

At what age do young children begin to "play"?

THE MOTOR BEHAVIOR of the young child has its beginnings in the early weeks of prenatal life, a fact we are artfully reminded of by the title of a recent report, "Fetal Frolics." It has been said that the creative artist tests life in his pulses; it might equally be said that the young child tests life in his muscles. He progressively extends his mental horizon by his ability to focus his eyes and hold his head up, then to sit steadily and survey his world, and finally

to move on all-fours or afoot to bring what he sees within reach of his exploring hands, lips, and tongue. The young child assimilates experience and captures impressions in his movements; he is the plane that flies overhead, zooming tip-toe with outstretched arms; he is the racehorse, throwing back his head and arching his back. His activity is the wellspring of his laughter and the most frequent expression of his anger and frustration. It reflects his judgment and mirrors much of his learning. It serves as a rough and ready means of communication until language takes its place. How does this behavior develop?

The most striking developmental changes in motor behavior occur within the first two years of life. During this period the child acquires such basic human behavior as an erect posture, upright walking, and manual dexterity in reaching, grasping, and fine manipulation. One has only to contrast these accomplishments in a two-year-old with the helplessness of the newborn to realize how important such behavior is in the development of the individual and the human species.

Development of Human Motor Characteristics

Parents with a baby in the house are likely to refer with pride to his learning to walk. How does a baby "learn" to walk, to creep, or even to sit up?

Development of Erect Posture and Upright Walking

What we know about the development of erect posture and upright walking in infancy stems pretty largely from the work of five investigators, each of whom made frequent repeated observations on a group of infants—Shirley, 1931, 25 infants; Gesell, 1928, 50; Bayley, 1935, 61; McGraw, 1940, 82; and Ames, 1937, 5 infants. Each developed descriptive classifications of the kinds of behavior he or she observed in natural or standardized test situations, and each (except Shirley, who made her observations in the infants' homes) made extensive cinematographic records. Problems studied by these methods were the *identification of phases* in the development of erect posture and upright walking, the *order of appearance* of these phases, and the *factors* which seemed to be *associated with their time of onset*. The reliability with which these phases of behavior were identified is expressed in terms of the percentage agreement between independ-

ent observers. Thus in one study (McGraw, 1940), agreement between observers in identifying phases in infant creeping was 84 per cent for a group of 13 staff members, 76 per cent for a group of psychology students.

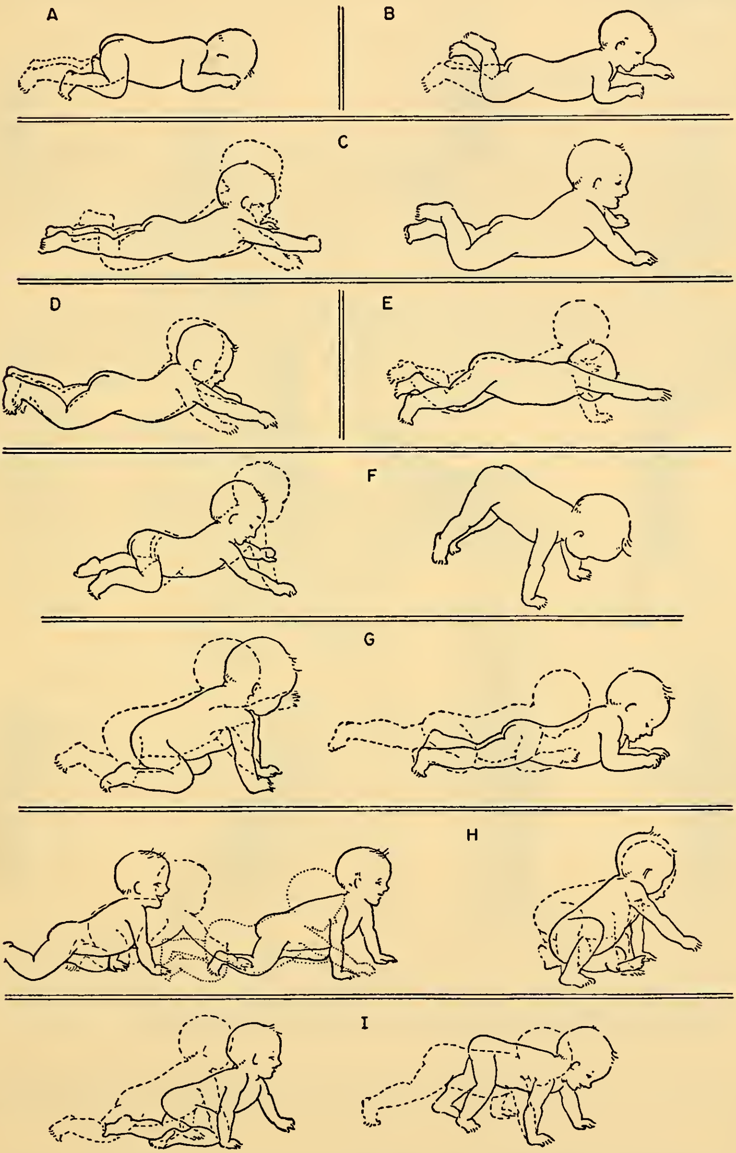

Figure 33. Nine phases in the development of creeping behavior. From M. B. McGraw, *The Neuromuscular Maturation of the Human Infant*. Columbia University Press, 1943. By permission of the publisher.

From these studies three kinds of information are available: descriptions of phases in the development of erect posture and upright walking, analyses of the process by which children pass from one phase to another, and age norms or standards of performance. These last are presented in the form of test items in developmental schedules.

Phases in Development

Phases in development are depicted in line drawings as well as in descriptive statements. Nine phases in the development of creeping behavior, identified by McGraw, are presented in this way in Figure 33. As these drawings indicate, there is a progressive development of coordination, and there is some evidence of a head-to-toe direction in the development of this coordination. The same progression is apparent in line drawings of six stages in upright walking (see Figure 34). What these drawings of upright walking are unable to reveal is

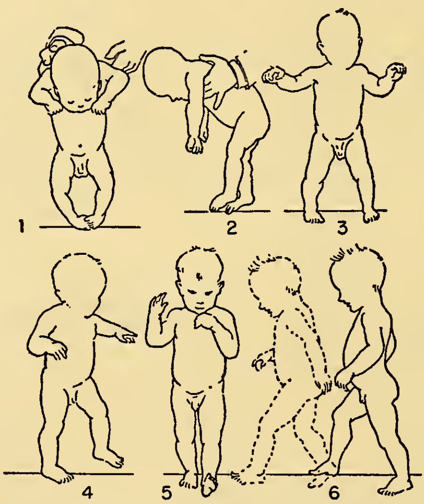

Figure 34. Stages in the development of upright walking. Adapted from M. B. McGraw, *Growth.* Appleton-Century-Crofts, 1935. Reproduced with permission of the author and publisher.

that there is also a progressive increase in the speed of walking and length of step, and a decrease in width of step, stepping angle, and use of balancing movements of the arms.

A pictorial sequence of a variety of activities is also offered by Shirley (Figure 35). As the ages she lists are based on medians for performance of 25 infants in Minnesota, it is of interest to

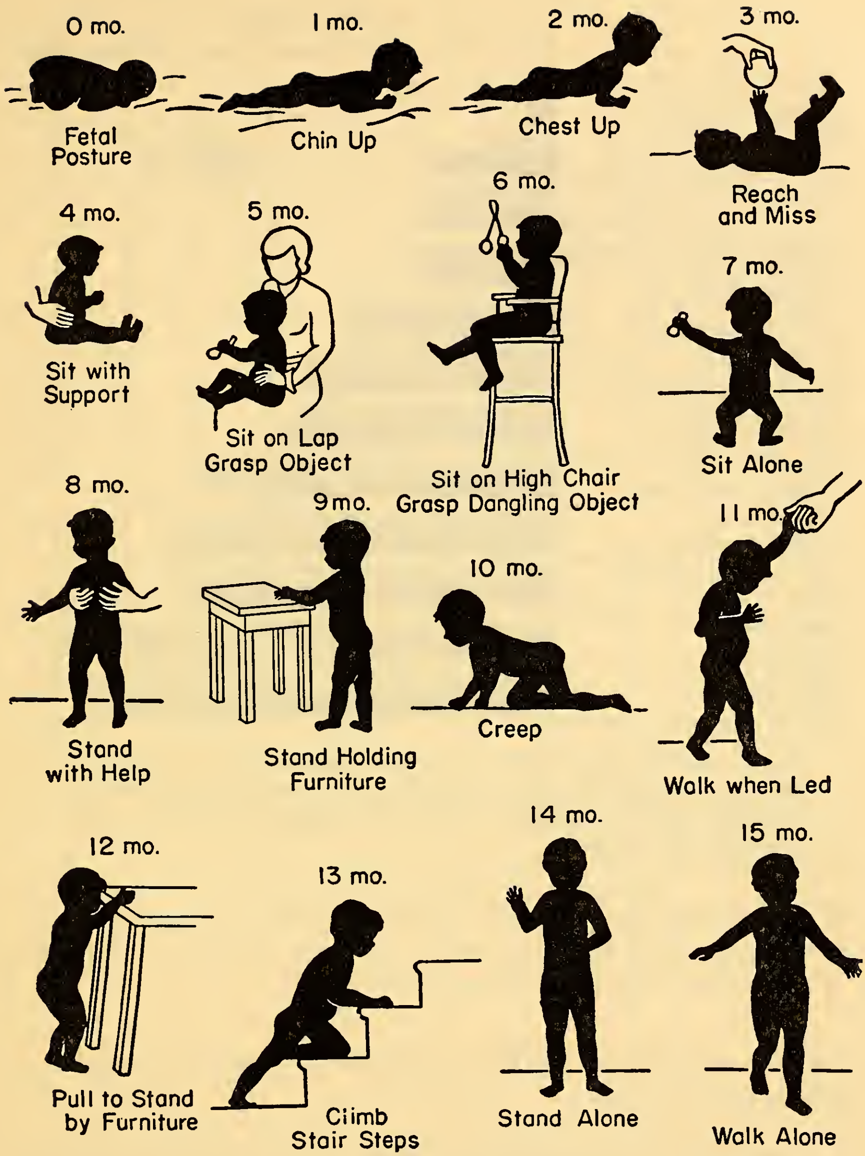

Figure 35. Shirley's developmental sequence. From M. M. Shirley, *The First Two Years, A Study of Twenty-Five Babies.* Vol. I, *Intellectual Development.* Inst. Child Welfare Monogr., Ser. No. 8, University of Minnesota Press, 1933.

compare them with similar medians for Bayley's group of 61 infants in California (Figure 36). Though it would be pointless to memorize medians for either group because of the small number of cases involved, they are most helpful in indicating, in a general way, the kind

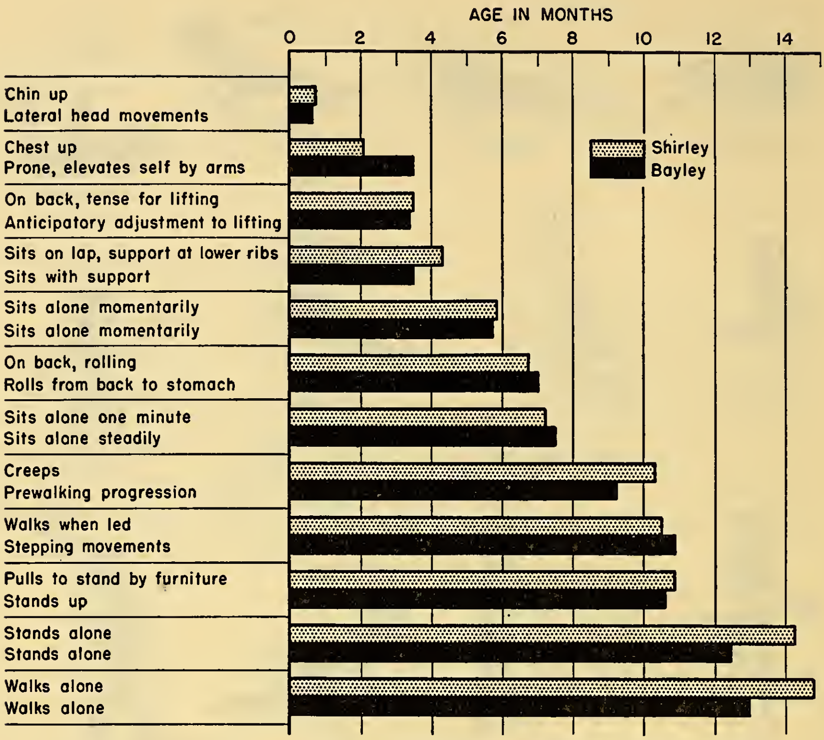

Figure 36. Median age of motor performance in Shirley's and Bayley's group of infants. From N. Bayley. *The Development of Motor Abilities During the First Three Years,* Monogr. Soc. Res. Child Develpm., Vol. 1, 1935.

of activities and play materials that infants of different ages are likely to enjoy, the kind of support they need when carried, and the kind of precautions required to ensure their safety.

Play Materials Suited to Different Phases of Postural Control and Motor Development

During the first three months of life when the infant is gaining control of eye, head, neck, and shoulder muscles, he can enjoy looking at objects. Thus a mobile comfortably in an infant's range of vision offers interest in its color, form, movement, and the shadows it casts on the wall; and gently tinkling Chinese chimes suspended near his crib reward his head-turning efforts to catch sounds and to look in their direction.

In the 3–6 months period, when the infant is developing control of the upper trunk and can be propped up for short periods, his de-

veloping skill in reaching and grasping is an obvious basis for selecting play materials for him. These, as we shall see later, will be more interesting if they are brightly colored and make interesting sounds, and safer in use if they are light, because young infants have little control of their arm movements and could hurt themselves with something heavy. Objects should also be washable and nontoxic, since the 3–6-months-old child leads a hand-to-mouth existence.

In the 6–9 months period, when the infant develops the ability to sit steadily without support, he can enjoy bath toys without the hazard that he will submerge. He can also use a bar over his crib to pull himself to a sitting position, and can engage in lusty arm activity with accompanying sound effects, if he is provided with a wooden spoon and a resonant surface to bang it on. As creeping begins, a floor surface that is not too slick and that offers reasonable toe and finger hold makes creeping and rolling enjoyable, and a ball that rolls away offers a goal to work toward.

During the 9–12 months period, when the infant is absorbed in pulling himself into an upright position and literally trying his legs, a play pen with railed sides for pulling on and clutching at during the first experimental steps offers safe and stimulating experience.

After one year if a child is not yet walking, a bouncer provides the exhilaration of bouncing on the toes without the hazard of falling, and a kiddy car makes stepping movements and progress on wheels simultaneously possible and enjoyable. Once walking starts, objects to push or pull offer added incentive to movement from one place to another. As Figure 37 shows, the pleasure of beginning walkers in this sort of prop has been recognized for centuries.

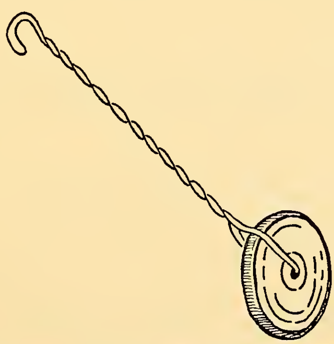

Figure 37. Early walking toy represented on Greek vases.

The infant's stage of postural and motor control thus indicates the kind of activities and materials he is ready for. As infants reach these stages at different ages, one cannot of course prescribe materials

or activities for an infant without knowledge of the particular infant's behavior. But Bayley's and Shirley's medians are helpful in making a better estimate of what an unknown child or group of children may be ready for.

The infant's stage of postural control and motor development also suggests the kind of support he needs when held or carried.

Postural Support Required at Different Stages of Development

Until a baby can hold his head up, a supporting hand or arm is needed beneath it. Once the child can lift his head and chest clear of a surface, adult support in holding him need not extend beyond his shoulder blades. When momentary sitting up followed by toppling begins, support can be shifted down to the waist region, descending later as the child steadies, to his hips. A mother's hold on her infant and the infant's response thus conveys some information concerning the child's stage of postural control and some clue to his age.

Stage of postural control and motor development likewise suggests precautions that adults should take for infants' safety.

Safety Precautions Required During Different Phases of Early Motor Development

In the first weeks of life before a baby can turn his head freely, he should not be offered a downy head pillow from which he might not be able to free his nose for breathing. Similarly, once he can roll over or change his position appreciably he should not be left alone on a bed or table without barricades of some sort.

When reaching and grasping begin, all dangerous objects need to be removed from his reach and from his crawling and climbing range. At the pulling-up stage, similar measures are required to eliminate gripping or pulling hazards. Such measures all suggest that an infant's ranging space be circumscribed by walls, fences, doors, or gates, and that he be under some supervision during most of his twenty-four hours. These are requirements that in turn have obvious implications for housing designs and for mothers' dovetailing of their housekeeping and child care activities. Unfortunately the obvious is often overlooked. Figures for home accidents to young children continue to offer a statistical reminder of the need for relating safety precautions to the developmental level and individual characteristics of young children.

The process by which children pass from one phase to another

is illuminated by study of the age distributions for each phase in a group of children.

Characteristics of the Process by Which Children Pass from One Phase to Another

Figure 38 presents a plot of the age distributions for the nine phases in prone progression (crawling on stomach, hands, knees, and

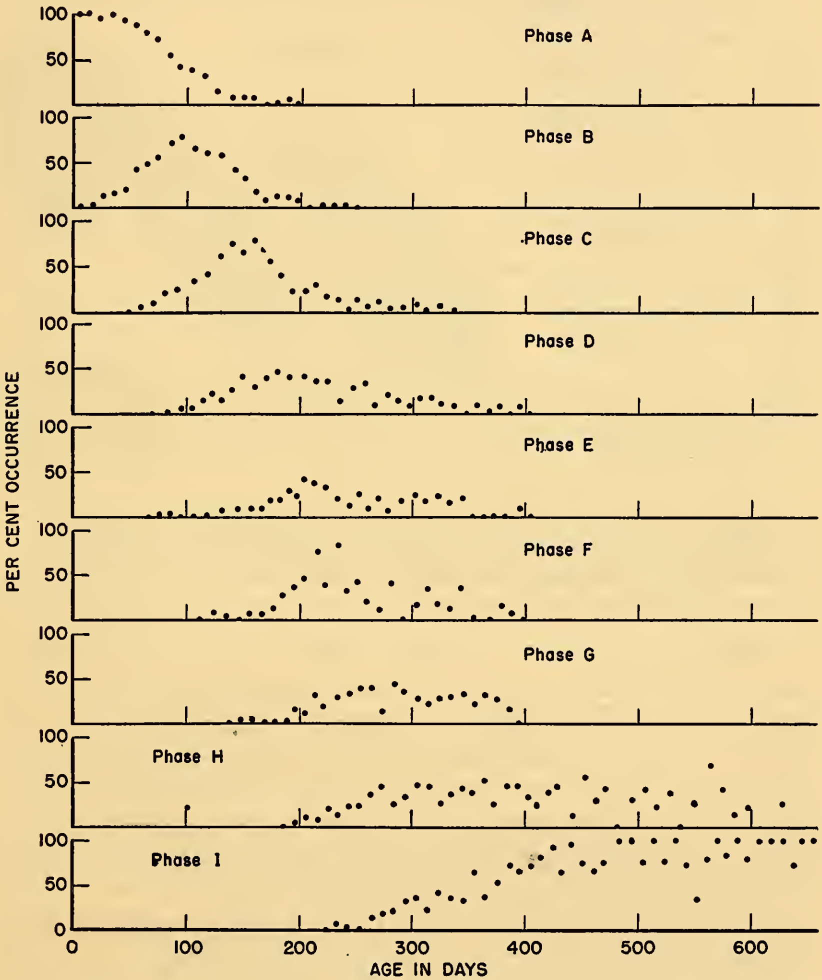

Figure 38. Age distribution for nine phases in prone progression. From M. B. McGraw, *The Neuromuscular Maturation of the Human Infant.* Columbia University Press, 1943. By permission of the publisher.

feet) identified by McGraw (1941). Her graph offers conclusive evidence that identifiable phases in prone progression overlap each other showing a wave-like advancement with increasing age. This wave-like character of development is even more evident in the chart prepared by Gesell and Ames (1940), (Figure 39). Here periods of consolidation, regression, transition, and progression suggest the complex cyclical character of motor development.

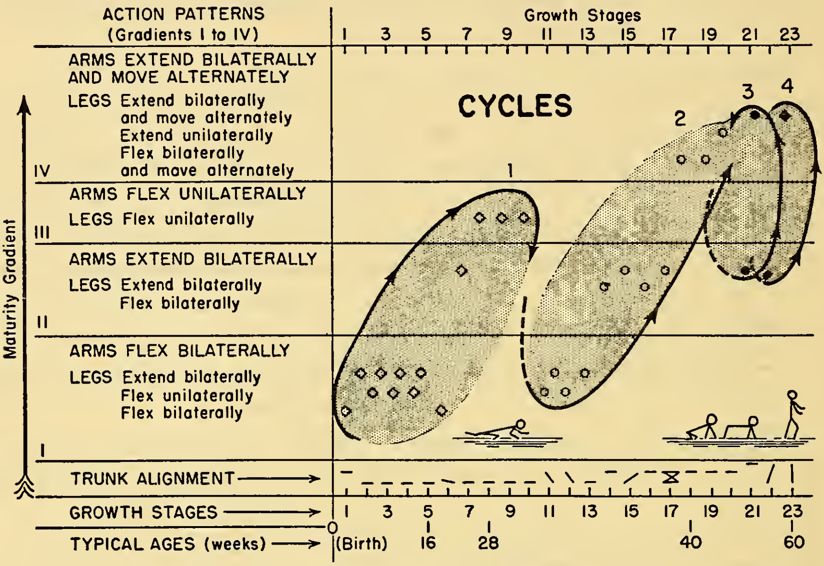

Figure 39. Cyclical character of prone progression. From A. Gesell, "The Ontogenesis of Infant Behavior," L. Carmichael (Ed.), in *The Manual of Child Psychology.* John Wiley and Sons, Inc., 1954. Reproduced with permission of the author and the publisher.

This phenomenon is one with which all parents are familiar. Most mothers have been surprised and sometimes chagrined to find that they had reported their baby could do something, only to find that he was unable to do it some days later. This lack of stability of emerging motor performances has similarly been noted by investigators developing test items for infants and has led to their deferring credit for a specific performance until a child performs satisfactorily on two successive occasions (Bayley, 1935).

This brings us to consideration of the kinds of normative scales for infant motor behavior which are currently available.

Normative Test Items, Scales, and Developmental Schedules

Examples of such normative test items and scales are offered in Bayley's California Infant Scale of Motor Development (1936) and

Gesell's Developmental Schedule (1928). The items in these scales are standardized in terms of the percentage of infants exhibiting such behavior at different ages. Though the number of infants tested is rather small for normative purposes, the exact quantitative data the scales offer are valuable in comparing performances of different children at the same age and in relating performance of a specific infant at an early age to that at a later date.

In summary, what the charts and scales and such films [1] as Bayley and Jones' "Development of Locomotion" and Gesell's "From Creeping to Walking" reveal is that development of an erect posture and upright walking is a gradual process achieved by passing through an orderly sequence of steps or phases. Though the general features of these phases are predictable (the child sits before he stands), individual differences appear in minor details. The direction of development is cephalo-caudal (the infant holds his head up before he stands on his feet) and proximo-distal (arms and legs come under control in creeping before hands and feet function independently of the total arm or leg). Other characteristics of development of locomotion are that it varies in rate (some infants begin to walk at 9 months, others not until 18 months); it shows a progression from involuntary to voluntary movement (as in reflex and voluntary stepping), and from total involvement of body musculature (as in beginning walking) to a minimum functioning of the neuromusculature directly involved in the act.

Reaching, grasping, and manipulatory behavior also show identifiable stages of development. These sequences also indicate the kind of experiences an infant is likely to enjoy and the kinds of precautions necessary to ensure his safety in grasping and manipulating objects within his reach.

Manual Dexterity in Reaching, Grasping, and Fine Manipulation

Detailed analyses and extensive cinematographic records of the development of reaching and grasping are based on observations made on large numbers of infants (Gesell, 1936, Halverson, 1931, 1932, 1937a,b,c, and McGraw, 1940a), some of whom were observed at frequent intervals. The behavior analyzed and recorded includes responses to a dangling object by infants laid on their backs, responses to rods brought in contact with their hands, and responses of seated infants to cubes, pellets and other objects placed on a table in front of

[1] See list of films at end of chapter.

them. By these methods, the investigators studied the characteristics and duration of the grasp reflex and the developmental phases in voluntary reaching and grasping.

Grasp Reflex

In a study of the grasp reflex in infants under 24 weeks of age (Halverson, 1931), it was found that 27 of the 97 infants observed were able to support their own weight from a one centimeter rod when they were grasping with both hands. The percentage of infants who could do this was greater at birth and four weeks than at later ages. After 24 weeks the reflex was no longer obtained. The infants' response was affected by factors other than age. In periods of heightened activity, the grip was stronger. Hungry infants also gripped harder than satiated infants, though with fluctuating strength.

Voluntary Grasping

In voluntary grasping, the size and motility of objects affected the type of neuromuscular movements used. Four general stages were identified—visual location, approach by the hand, the grasp of the object, and disposal of it. Ten types of grasp representing a developmental sequence were also defined. These occurred in infants ranging from 16 to 52 weeks of age.

Reduced to general terms, there is (as Figure 40 shows) a progression from no contact to contact, from palm to finger action

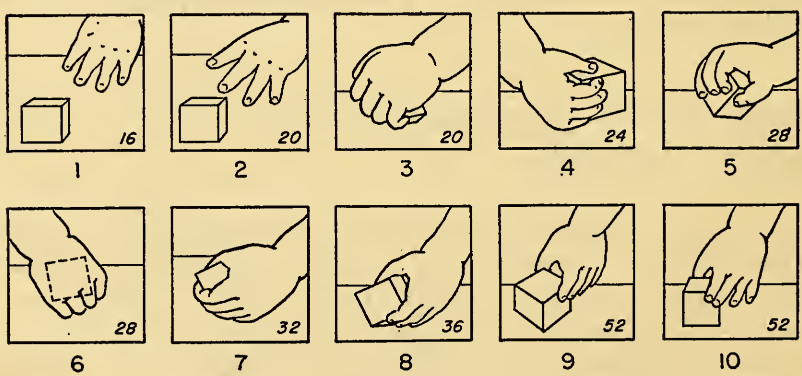

Figure 40. Developmental progression in grasping. From H. M. Halverson, "An Experimental Study of Prehension in Infants by Means of Systematic Cinema Records," *Genet. Psychol. Monogr.*, 1931, *10*, 107–286, The Journal Press. By permission of the publisher.

of a clawing type to a later stage in which the thumb and forefinger function in opposition in a pincer movement. The pre-pincer, pre-clawing stage is perhaps best evoked by a writer's description of a baby's little starfish of a hand.

There are of course other component coordinated acts in reaching than those of the palm and forefingers. Trunk, shoulder, elbow, wrist, and visual processes are also involved. Early attempts at reaching therefore involve "a crudely functioning hand at the end of a poorly directed arm." Early attempts at reaching also involve eye-hand coordination. The infant has to keep his eye on what he is reaching for, hence the concentration with which an infant closes in on a fistful of parental hair, a loose earring, or other costume accessories of his adult attendants. With increasing age this concentration becomes less necessary. On the basis of a study of reaching behavior in 73 children aged from one month to four years (McGraw, 1940), the investigator concludes: "as precision in neuromuscular functioning develops, the visual component becomes progressively liberated until the child can reach while looking in the other direction." Before this stage of precision is reached, the child's ability to focus a nearby object and to judge its size, distance, and position are necessary components of successful grasping. The learning process involved in dispensing with the need for looking is of course a feature of the development of manual coordination in learners of all ages, as one is reminded in recalling the early stages of learning to use a typewriter or play the piano.

In summary, there are a series of developmental progressions in object manipulation ranging from visual location of an object to attempts at reaching for it, from eye-hand coordination in grasping to progressive independence of visual effort, from crude raking movements in manipulation to pincer-like precision in handling with an opposed finger and thumb, from large muscle activity of the arms and shoulders to fine muscle activity of the fingers, from maximum involvement of body musculature to minimum involvement and greater economy of effort, and (as will be discussed later) from bilateral reaching and manipulation to use of a preferred hand. There are also indications that in development of manipulation as in the development of walking, learning as well as developmental factors plays a part. What their respective parts are will be discussed in detail later in this chapter.

If an erect posture and some skill and coordination in manipulating objects and in moving around on all-fours or afoot, are the major motor accomplishments of the first year and a half of life, what are those of the post-walking period?

Motor Skills and Achievements of the Post-Walking Period of Early Childhood

Motor performances of this later period are to a greater extent the result of a learning process that involves special opportunities and possibly specific coaching. The child who has never been near the water doesn't swim, the boy who has never worn skates doesn't skate. There are however some performances that represent extensions of early ambulatory and manipulatory activities in which all children have presumably somewhat similar experience. These furnish the basis of test items in developmental scales of motor performance.

Developmental Motor Performances

Examples of such items taken from the California Infant Scale of Motor Development (1936), which is based on the performance of a somewhat selected group of approximately 50 children, are:

16.9 months—*Walks backwards.* Credit if he takes several steps backward.

20.3 months—*Walks upstairs with help.* Credit if he walks up the steps holding to the wall for support.

24.3 months—*Walks upstairs alone; marks time.* Credit if he walks upstairs without support of the hands, standing with both feet on each step before stepping up to the next.

28.0 months—*Jumps off floor; both feet.* Credit if he succeeds in jumping off the floor with both feet together.

30.1 months—*Walks on tiptoe.* Credit if he succeeds in walking a few steps without his heels touching the floor.

32.1 months—*Jumps from chair.* Credit if he jumps with both feet together.

35.5 months—*Walks upstairs, alternating forward foot.*

39.7 months—*Distance jump, 36 to 60 cm.* Credit if he jumps at least 36 cm.

49.3 months—*Hopping on right foot 2 or 3 hops.*

Motor accomplishments in which environmental circumstances play a more obvious part have been studied by measuring children's performance in standard test situations and by noting the level of skill they exhibit in their free play activities. The kinds and levels of skill developed by one group of four-year-olds in a well-equipped

nursery school is cinematically recorded in a color film—"Large Muscle Skills of Four Year Olds" (Landreth and Gardner).[2]

Large Muscle Playground Performances

Activities in which age and sex levels of performance have been measured are: ascending and descending steps and ladders; throwing, catching, and bouncing balls; jumping from boxes and ladders; and hopping, skipping, and walking on a line (McCaskill and Wellman, 1938, 98 children, 26 to 74 months). Other activities in which performance of slightly older children has been tested (Jenkins, 1930, 300 children, 5, 6, 7 years) are the thirty-five yard dash, fifty-foot hop, basketball throw, soccer kick, bean bag toss and basketball throw at a target, standing broad jump, and jump and reach.

In these activities, boys averaged a better over-all performance than girls. The only accomplishments in which they lagged behind the girls were in skipping and hopping fifty feet. In throwing a basketball, kicking a soccer ball, leaping in a running broad jump, and tossing a bean bag or a basketball at a target, differences in favor of the boys were statistically significant. As no sex differences are reported in motor test performance (Bayley, 1935) on behavior items in which both sexes have similar practice, boys' superior performance in most playground activities would seem to be due to the selective encouragement and opportunity given boys and girls in our society to throw, kick, dash, jump, hop, and skip.

Age as well as sex differences were found in large muscle activities. It is of course no surprise that older children perform better than younger ones. What is of interest is that performance has a somewhat different function in the play of older children. This is revealed in two observational studies. In one (Jones, 1939), descriptive records were made of the wheel toy activities of 24 children observed at monthly intervals from the time they were 21 to 33 months of age and again when they were three and four years old. In another (Gutteridge, 1939), teachers made ratings and normative observations on the performances of 1,973 children, two to seven years of age, in climbing, jumping, sliding, tricycling, hopping, galloping, skipping, and throwing, catching, and tossing a ball.

In both studies there was evidence of progressive subordination of performance to its social purpose. For example, with increasing age there was a change in use of wheel toys from unskilled repetitive activity to purposeful action related to a project or dominating idea.

[2] See list of films at end of chapter.

In other activities, teachers observed that children over four years of age showed little advance with age in the level of performance exhibited in their play. Instead they took to devising stunts. The investigator's interpretation of this plateau in performance is that children probably exhaust the possibilities of standard playground equipment by the time they reach four years. What seems equally probable is that with increasing age, activity for its own sake begins to pall. Performance then becomes a means to an end rather than an end in itself.

Closely related to children's large muscle performance is their rhythmic performance of large muscle activities.

Rhythmic Performances

What makes this kind of performance of particular interest is that much time, effort, and money is currently spent by adults in trying to induce young children to walk, clap, tap, bounce, and pound in time to music. Is this a fruitless undertaking? Several studies suggest that the outcome depends on the kind of rhythmic experience provided. When this is limited to enforced keeping time to a mechanically produced sound pattern, practice is apparently fairly unproductive. For example, in two studies, records were made of children's attempts to tap synchronously with a mechanical periodic sound pattern. In one (Williams, 1932, 162 children, 2–6 years), the sound was made by a Hollerith counter and the tapping was done with a light hammer. In another (Van Alstyne, 1940, 307 white children, 274 Negroes, 2½–6½ years), clapping blocks were used in place of the hammer. Sound patterns presented were both simple and complex and two speeds of presentation were employed—.50 and .75 second. Children were required to tap in time with a sound pattern in one test, and in another to repeat a sound pattern they had just heard. In a third study of the effect of practice on children's rhythmic response (Jersild, 1935, 95 children, 2–5 years), cinematic records were made of children's walking and beating time with their hands to the accompaniment of a mechanical piano. Some of these children were given 40 to 50 periods of practice over a five-months period, and then retested.

Research results and some implications from these three studies are summarized below:

Uniqueness of rhythmic performance: Keeping time to music or to any sound pattern is a unique ability. Correlations between rhythm performance and other motor tests were low save for walking rhythmically.

This suggests that encouraging children in spontaneous rhythmic activity may be a good beginning for later more formal training.

Age changes: There was an increase with age in the ability to keep time to music, suggesting that activities based on this ability might well be deferred until kindergarten years.

Performance at different speeds: Accuracy was greater for the faster speeds. For tapping, accuracy was greater when sounds were produced at rate of one per .50 second than one per 1.00 second. For walking and clapping hands, accuracy was greater at 186 beats a minute than at 76 beats, suggesting the difficulty young children have in inhibiting movement and hence the need for relating organized rhythmic activities to their natural tempo.

Performance accompanying and repeating sound patterns: Children were more accurate in reproducing a rhythmic pattern of sound after than during its presentation. This finding is pleasantly illustrated in a record for young children, "The Little Indian Drum" (Young Children's Record Co.). In it an Indian father beats a message for his son on the drum. The son first listens to and then successfully repeats the message.

Walking and clapping performance: There was no statistically significant difference between accuracy of keeping time with feet in walking and hands in clapping.

Effects of practice: Practice, of the kind described, in keeping time to music did not appreciably improve children's performance.

Though young children did not improve as a result of practice in walking and clapping to the accompaniment of a mechanical piano, this does not mean that they are incapable of benefiting from *any* rhythmic activities. In the study which involved Negro subjects, the Negro children did considerably (50–100 per cent) better than whites in synchronizing movements to simple sound rhythms at slow and fast speed. In explaining the superior performance of the Negroes, the investigator suggests that it may be due to their *training at home in related activities.* Further evidence of the value of a free and varied approach to rhythmic performance comes from an observational study (Christiansen, 1938, 73 children, 2–6 years) of the many spontaneous rhythmic responses of children in nursery school and kindergarten groups. These children's activities led the investigator to conclude that work in rhythm with young children should not center in ability to keep time. Instead, children should be given a variety of opportunities to improvise rhythmic patterns of their own, to participate in rhythmic activities, and to cultivate interest in rhythm.

To illustrate, one Sunday I was visited by a college dance instructor and her three-year-old son. After lunch and a nap the son said "Let's dance, Eleanor" (Eleanor is his mother's name). They removed their shoes and a space was cleared. Thereon the little boy did

a few warming up stretching exercises he had seen his mother's students do in her studio. Then she said, "What dance will we do?" He said, "A running dance" and they tripped round lightly poised in graceful rhythmic motion. Next he elected a jumping dance and bounced lightly and rhythmically on his toes. In all he completed six dances before putting on his shoes. All were of his own devising and all were based on movements that are a normal part of a little boy's repertoire. All were charming, reflecting as they did his spontaneity and self-imposed control in rhythmic movement.

Giving a young child a chance to experience rhythm in his own body movements would thus seem more developmentally appropriate than requiring him to attempt the more complex process of synchronizing his body coordinations to an adult-imposed sound pattern. Much of the "keeping time" activity imposed on young children appears in fact socially pointless; indiscriminate banging, clashing, stamping, and clanking responses to music are forms of behavior which no concert artist or audience would tolerate.

Performance in Art Activities

Information of a general descriptive sort is available concerning children's block building and drawing. A little book, *The Art of Block Building* (Johnson, 1933), presents line drawings and descriptions of 69 block constructions of nursery school children, ranging in age from 2.6 to 6 years. The structures (see Figure 41) suggest

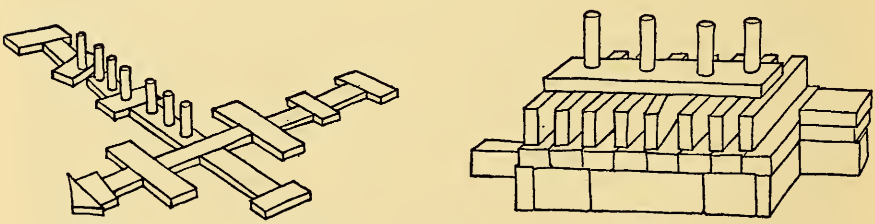

Figure 41. Block structures of young children. *The Development of Block Building.* New York: Bureau of Educational Experiments, 1933. By permission of the publisher.

the degree of coordination and technical skill that can be developed when young children have blocks of interesting proportions and have educational guidance which facilitates the development of ideas and skills. The structures also suggest that children derive satisfaction from abstract composition as well as realistic reproduction, a fact

which should silence ill-advised adult questions about the specific utilitarian function of a child's block building.

In another booklet, *Children's Drawings from Lines to Pictures*, (Biber, 1934), developmental stages are traced in the drawings of young children. These descriptive stages, based on analysis of 7,000 drawings made by 50 children 21 to 48 months of age, are:

a scribbling and dotting stage,
a progressive development of control of lines,
enclosure of space by lines,
development of design by repetition of simple enclosure patterns,
representation. (See Figure 42.)

The descriptions and illustrations are a reminder that creative efforts of young children represent their level of sensori-motor develop-

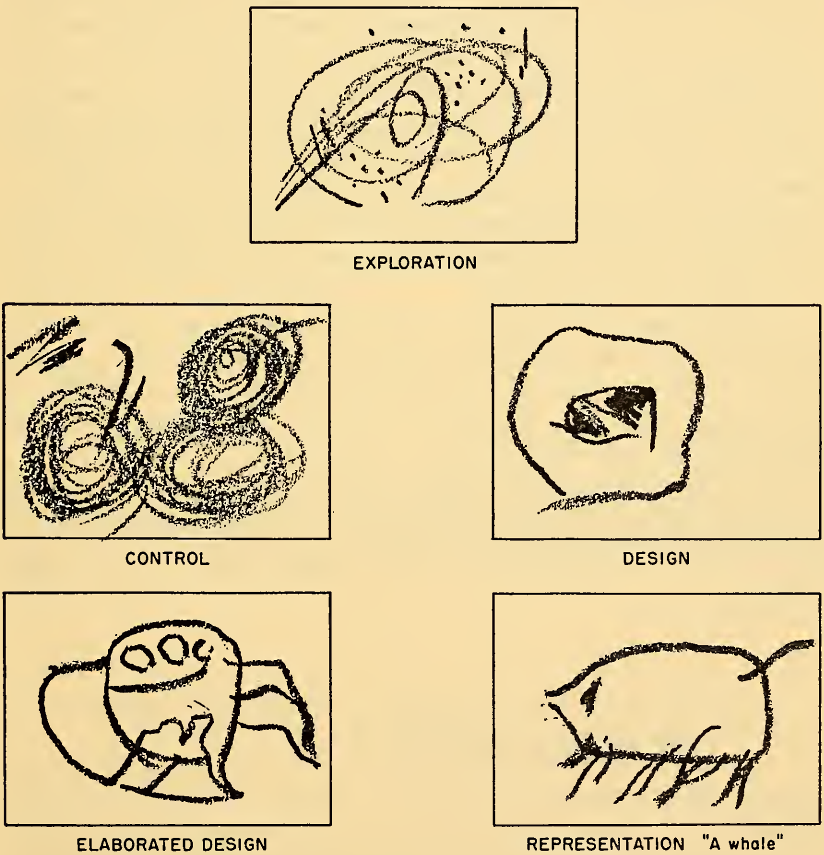

Figure 42. Stages in young children's drawings. From B. Biber, *Children's Drawings from Lines to Pictures*. New York: Bureau of Educational Experiments, 1934. By permission of the publisher.

ment as well as their ideas and perceptions. Hence it is unwise to press a child to name his products. The process of drawing may be so satisfying that the product is hardly considered. To ask him what he is drawing is like asking him why he is running. He often does both just for the fun of it.

Self-Help Performance

A type of performance of particular interest to parents is that involved in self-help in feeding, dressing, and taking care of personal needs. What can parents expect or hope for at different ages? Obviously the kind of feeding and dressing tasks a child is confronted with, the kind of help and encouragement he is given, and the kind of relationship he has with his parents will affect the skill he develops. There is evidence, though, that developmental factors play a major part in these performances. In a study of dressing skill (Key, 1936, 45 children, 18–65 months), children's performance in six dressing trials was measured in terms of an achievement scale. Though marked individual differences were found in dressing skill, in progress in learning to dress, time taken and number of verbal helps needed, a correlation between dressing score and chronological age of .75 led the investigator to conclude that developmental factors appear more important than routine training.

In the light of these age and individual differences, it is obviously unwise to expect all children to meet the same standard of performance in dressing or feeding themselves at any given age. However, as we will see later, some methods of fostering these performances are more effective than others.

The variety of motor abilities which young children develop during the post-walking period reflect a progressive expansion of sensori-motor coordination. They also reflect other growth characteristics.

Characteristics of Motor Abilities of the Post-Walking Period

Speed

There is an increase in speed of performance with age. In a study of speed of reaction to a sound stimulus (Goodenough, 1935),

uniform increases were found with age, and positive correlations were obtained between speed of response and height and weight. Young children therefore need to be given time to complete an activity a brisk adult might accomplish in seconds.

Speed of performance is also related to temperamental factors. In a study of the basic components of activeness in young children (Koch, 1934), analyses were made of the intercorrelations between nine measures of activeness. As a result of this statistical procedure (which will be described in greater detail in Chapter 13) three factors or components were isolated: strength or maturity, spontaneous activeness or aggressiveness, and nervousness or emotionality. The relationship between emotional characteristics and speed of response is indicated in another study of reaction time of 100 five-year-old boys and girls to a sound stimulus (Pomeroy, 1938). It was found that extroverted boys were speedier than introverted boys and that the quicker girls received average rather than extreme scores on ratings of extroversion and introversion. This evidence of individual differences in tempo which are in turn related to individual differences in temperament suggests that more attention might profitably be paid to an individual's motor characteristics in arriving at some understanding of his personality characteristics. It also reminds us that speed is a subjective impression as well as a measurable characteristic. What may appear dawdling to a quick-tempoed adult may seem brisk performance to a slow-tempoed child.

Strength

Strength of grip also increases with age. In one study (Metheny, 1941) which used the ingenious dynamometer shown in Figure 43, grip strength of boys and girls more than doubled during the period from three to ten years, with boys superior to girls at all ages.

Use of Materials

A distinguishing characteristic of young children's spontaneous activities is that they involve materials briefly used for a variety of purposes. In a study of use of play materials by nursery school children (Van Alstyne, 1932, 112 children, 2–5 years), it was found that the children spent 98 per cent of their time in play with materials.

This observation has practical implications. In the interests of safety, young children, who are now among the most frequent victims

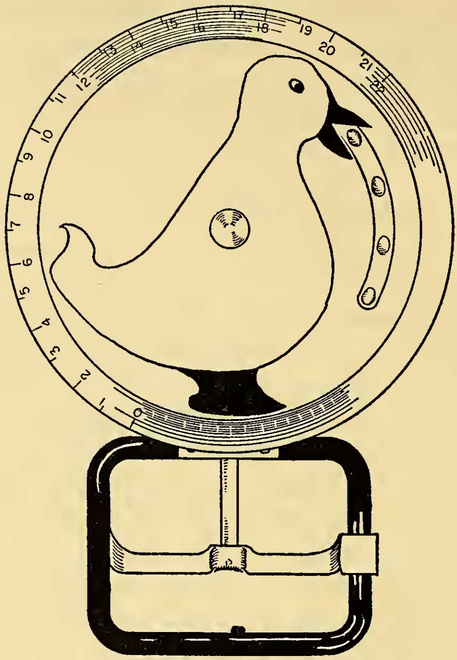

Figure 43. Sketch of dynamometer used in testing grip strength. From E. Metheny, "Breathing Capacity and Grip Strength of Preschool Children," Univ. Iowa *Stud. Child Welfare*, 1941, *18*, No. 2. University of Iowa Press.

of home accidents, should be protected from hazards in manipulating materials by having all dangerous ones removed from their reach. Similarly, in the interests of peace and harmony and property preservation, young children invited to parties or social gatherings should be amply provided with materials for their active use. One reason young children's birthday parties so frequently degenerate into juvenile brawls is that there is usually too little play material for too many children. Evidence that they spend over 90 per cent of their time in contact with materials should make it obvious that, while one ball and a referee may keep a number of adolescent football players reasonably content, it takes a ball apiece to produce similar social harmony in three-year-olds.

Further, it takes some variety in materials, particularly if the children involved are under three years of age. In studies (Bott, 1928, Farwell, 1930) of the length of time spent by young children in play with any one material, median time spans at different ages ranged from three to eleven minutes with wide individual differences as well as increases with age. This is one reason why nursery school programs are

developed around "free play periods," in which children engage in freely chosen activities and change from one activity to another as their interests wax and wane.

The child's interest span in materials is not only brief, it is selective. As we shall see later in studies of the influence of cultural factors on children's activities, boys and girls early learn to choose materials and activities considered appropriate for their sex in our society.

Another characteristic of young children's motor activity is that it is engaged in for its own sake.

Activity for its own sake

Shirley and McGraw both noted that young children's play is a repetition of their newly acquired or developing skills. McGraw (1943) states "when function emerges, there is an indomitable urge to exercise it." In a later discussion of the relationship between motor and emotional behavior, we will consider how satisfying this urge may contribute to a child's well-being.

In developing motor skill, young children also develop unilateral functioning. They become predominantly right or left handed, footed and eyed.

Preferential Handedness

The earliest postnatal manifestation of an asymmetric or unilateral motor response is the tonic neck reflex which Gesell describes in the newborn. There is also, as the infant gets older, a progressive increase in the preferential use of the right hand. Thus, in a study of infants' acceptance of objects (Lippman, 1927), the right hand was used 50 per cent of the time at four and a half months of age, 70 per cent of the time at twelve months of age. Studies of handedness of nursery school and kindergarten children and of adults reveal that the children are 80 to 90 per cent right handed, the adults 95 to 97 per cent right handed.

Handedness, however, is not an all or none characteristic. Only a one-armed person is exclusively right or left handed. In a study of consistency of handedness (Updegraff, 1932), forty nursery school children were tested in spooning sand, spinning a top, hammering a block, and shaking a rattle. The percentage of right handedness in

the 35 predominantly right handed children ranged from 50 to 97 per cent. The percentage of left handedness in the 5 left handed children ranged from 55 to 80 per cent.

Preferential handedness is also more frequently associated with some activities than others. In a study involving 44 nursery school children (Hildreth, 1948, 1949), children's choice of hand for a variety of activities was observed. The children were more right handed in taught activities such as using a fork or spoon in eating, drawing with a crayon or throwing a ball, and less right handed in untaught activities such as eating with the fingers. The differences in right handedness for taught and untaught activities were apparent both in the number of children dominantly right handed and in the consistency of their handedness.

These observations raise the question of whether right handedness is culturally conditioned. In primitive tribes, there appears to be less right handedness than in the United States. In our civilization, the preferential use of the right hand may therefore be a social adaptation.

Arguments for a social developmental explanation of handedness are that right handedness increases with age, that it is more consistently found in taught than untaught skills, and that left handedness has increased in recent years when popular belief favors no interference with left handed tendencies. Relationships between handedness and sex, and handedness and intelligence can also be interpreted in social developmental terms. Girls, generally more subject to and more responsive to social training than boys, are more right handed than boys. Retarded children and mental defectives, generally less responsive to social training than children of normal intelligence, show an incidence of left handedness twice that of children of normal intelligence.

Turning to other explanations of handedness, arguments for an hereditary factor are based on reports of higher incidence of left handed offspring in left handed parents. This incidence could, however, be explained on the basis of social pattern and training procedures of left handed parents. Further, the fact that the left handed are not necessarily left eyed, and that the incidence of right and left eyedness is more nearly 50–50, suggests that there is no inherited consistent pattern of unilateral dominance and that a physical constitutional basis for handedness is therefore unlikely.

In designing a definitive investigation of handedness, it is thus apparent that age, sex, intelligence, social culture, and parental attitudes to handedness of the subjects must be considered, as well as the type of skills, the type of observation, and the index of handedness.

Hand Dominance and Stuttering

It is widely believed that there is a relationship between left handedness and stuttering. This belief is borne out by systematic observation. There are more stutterers among the left than the right handed, more stutterers among boys than girls. Among left handed children, there is more stuttering among those who are inconsistent in their left handedness. Conversely, non-stutterers are more consistently unilateral than stutterers. A plausible explanation (Hildreth, 1950) of these relationships is that manual inconsistency is one of the factors in stuttering. This explanation also accounts for the fact that some left handed children stutter following attempts to change their handedness. Incomplete retraining could result in inconsistency in handedness which, in turn, could be accompanied by stuttering. As to the higher incidence of stuttering in early than in late childhood, manual lateral dominance, mental integration, and speech are in a period of rapid development in early childhood. A higher incidence of stuttering at a time when there is greater inconsistency and instability in handedness is therefore not surprising.

Should a left handed child be changed to right handed performance? Many but not all left handed children are changed without difficulty. An investigator (Hildreth, 1950) who has studied this problem intensively suggests the following as favorable prognostic indications for changing:

the child is under six years;
the child uses both hands interchangeably;
the handedness index is bilateral;
a trial period shows no permanent difficulty;
the child is agreeable to the change;
the child is above average in intelligence.

Stability of Performance in Early Childhood

Parents of young children often remark with exasperation that their child can do better than he is doing. They are probably right. Young children perform over a range of skill rather than at a level, exhibiting the progression, regression, and consolidation in their achievements that has already been described. Studies of the retention of motor skills during periods in which they are not practiced indicate further that retention of performance under these conditions

is dependent on retention of body proportions, as well as on the fixity of the activity at the time practice was discontinued. For example, in a study (McGraw, 1935) in which a child was given directed exercise in the activities of which he seemed capable during the first 22 months of life, an unusual level of skill was achieved in such performances as swimming, diving, ascending inclines, roller skating, and jumping off high boxes. Retest on these same performances four years later, with no practice in the intervening period, resulted in much poorer performances. The child's loss of skill in such activities as roller skating and ascending inclines seemed to be the result of a change in his center of gravity which made coordinations learned for a two-year-old body unsuited to six-year-old physical proportions.

Factors Affecting Development of Motor Skills

Studies of the kinds and characteristics of young children's motor activities, so far reported, suggest that many factors affect their development. The orderly succession of stages identified in creeping and walking suggests the operation of developmental factors, the individual differences noted in levels of skill indicate the possibility of inherited motor characteristics, and the sex differences found in some performances make it clear that practice and cultural factors also play a part in motor performance. Do we know what the *relative* contributions of these factors are to development of different skills?

Relative Contributions of Developmental Factors and Experiences to Motor Performances

Performances Characteristically Developed by the Human Species

The relative contributions of maturation and practice to simple forms of behavior characteristically developed by the human species are explored in three studies. In one (Gesell, 1929) in which the subjects were identical twins, comparisons are offered of the efficacy of practice in stair climbing and cube combining given at an earlier and a later period of development. In another (McGraw, 1935), the effects of practice and encouragement on development of upright posture, walking, and creeping are indicated in comparisons of the performance of a systematically practiced and encouraged infant with that of a group of 57 normal infants. In the third study (Dennis,

1940, 1941), the effects of restricted practice are revealed in comparisons of the performance of infants whose motor activities were restricted with those who had no such restrictions.

The generalizations resulting from these studies are so related to the conditions under which the studies were made that some description of them is necessary.

In Gesell's study, a twin T at the threshold of climbing and cube combining (46 weeks of age) was given ten minutes practice and encouragement six days a week for six weeks in climbing a four tread staircase and in manipulating cubes. Training was thus directed at expansion of these activities, not at their initiation. During the six weeks twin T was undergoing training, her co-twin C was deprived of all experience with stairs and cubes. Beginning in the 53rd week of life, when T's training period was over, C was given similar training for two weeks. Stenographic and cinematographic records of the twins' progress during training periods were then compared with the results below.

At 52 weeks after six weeks of training, T's speed was 26 seconds.
At 53 weeks after no training, C's speed was 45 seconds.
At 55 weeks after two weeks of training, C's speed was 10 seconds.
At 56 weeks after an interval without training, T's speed first trial was 11.3 seconds.
At 56 weeks after an interval without training, C's speed first trial was 14.8 seconds.
At 56 weeks after an interval without training, T's speed second trial was 13.8 seconds.
At 56 weeks after an interval without training, C's speed second trial was 13.9 seconds.

From these results and from detailed analysis of the cinematographic records of the twins' progress, Gesell concluded:

"Learning appears to be profoundly conditioned by the factors of maturity. Training does not transcend maturation. Maturation however tends to supplant or modify the results of training."

Gesell's conclusion based on somewhat selective evidence touched off years of controversy over the relative effects of maturation and training or maturation versus learning. Its misinterpretation by many parents fostered a laissez-faire attitude to all respects of child training. After the doubts and confusion engendered by attempts to employ Watson's (1924) conditioning process—"give me a dozen healthy infants, well formed, and my own specified world to bring them up in, and I'll guarantee to take any one at random and train him

to become any type of specialist I might select"—intimations of the part developmental characteristics played in the establishment of behavior patterns appeared as a welcome invitation to let nature take its course. An enduring outcome of Gesell's widely reported generalizations on maturation is thus the concept he established in the minds of lay and professional people of the child as a developing organism with behavior in part determined by his level of development. To appreciate the value of this contribution, one has only to recall the social connotations of the "little adult" concept of earlier centuries.

In McGraw's study, one member of a pair of twins, at first thought to be identical, but later found to be fraternal, was given daily directed exercise in the motor activities of which he seemed capable from the time he was 21 days old until he was 22 months of age. Despite ingenious efforts to stimulate his performance in sitting alone, creeping, walking, reaching and grasping, his development of these skills was not accelerated, nor was he ahead of a group of 57 infants who received no such special coaching.

In Dennis' study of effects of restricted practice, twin girls were kept in cribs in a second floor nursery from the end of the first to the fourteenth month of life. A screen between their cots prevented their seeing each other. They had no toys until 49 weeks of age, no pictures, no view save sky and tree tops and no social attention save that necessary for their physical welfare. This amounted to about two hours a day of silent and presumably somewhat glum service, particularly during the first six months of the study. (In passing, it is of interest to note how development of theory in child psychology affects professional practice and lay opinion on child handling. This study performed in the early thirties could hardly be undertaken in the fifties without psychiatric and lay comment on its possible effect on the infants' welfare.)

As the twins were not propped up, put in a standing position, or given an opportunity to reach for objects, their performance in sitting, standing with support, and reaching for an object is particularly interesting. All three of these performances (see Figure 44) were accomplished later by the twins than by two groups of infants with whom their performance was compared (Shirley's 25 infants, and 40 infants for whom biographical records were available).

Motor performances involving eye and head muscles and hand to mouth coordinations were accomplished within the age range of both Shirley's and the infant biography group. In these performances it is possible that even alone in a crib the infants got some practice.

Dennis and Dennis concluded:

"Practically all of the common responses of the first year of life may be developed autogenously. In the development of the autogenous responses learning plays an important part."

In another study, Dennis and Dennis (1940) compare the median age of walking of two groups of Hopi Indian children. One group of 63 children had been reared on the cradle board, the other group of 42 had not been subject to this restraint.

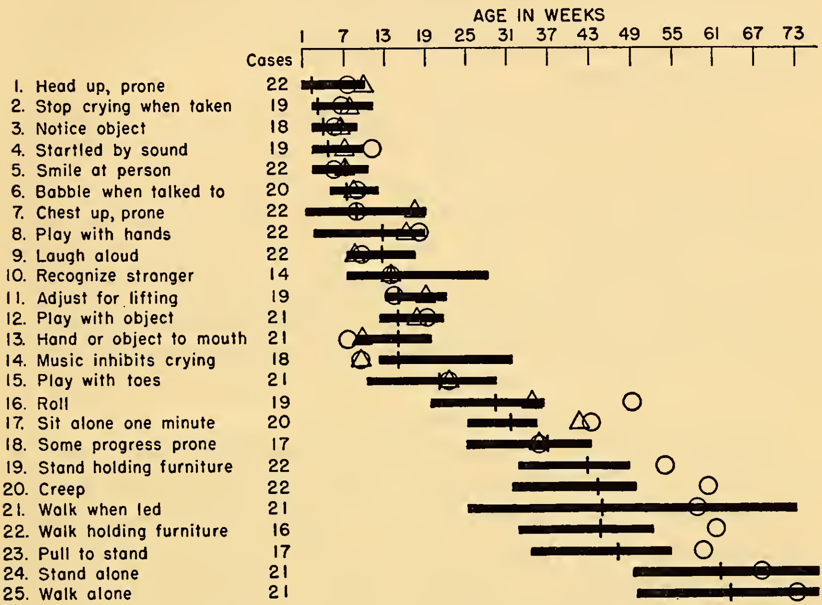

Figure 44. Comparison of age of performing for Dennis twins and other children. From W. Dennis and S. G. Dennis, "Infant Development Under Conditions of Restricted Practice and Minimum Social Stimulation," *Genet. Psychol. Monogr.*, 1941, *23*, 149–155.

The source of information concerning age of walking was the parents' report at a time when their children were from two to six years of age. In view of a California study on the reliability of records obtained from parents in retrospect (Pyles, 1935), the possibilities of error in this source of information must be kept in mind. Median age of walking for the group using the cradle board was 14.98 months and for the group who did not use the cradle board it was 14.5 months.

Lack of a significant difference in age of walking in these two groups of children is interpreted by Dennis as evidence that cradling customs do not affect age of walking.

In sum these studies *suggest* that *special coaching, of the sort so far attempted, in simple skills universally acquired by the human species does not greatly affect their time of onset.*

What of skills which are not universally acquired and which cannot develop without specific kinds of experience?

Performances Requiring Specific Kinds of Experience

Even in skills requiring specific kinds of experience there is evidence that environmental stimulation, practice, or coaching has little or no effect until a child reaches a level of maturity at which he can profit from such experiences.

In McGraw's study, Johnny (the fraternal twin who was given two or more hours directed practice and encouragement in motor activity during the first 22 months of his life) developed a newsworthy level of skill in swimming, diving, climbing inclines, roller skating, and jumping off boxes, that was not even approached by any one of a group of babies who did not have his athletic advantages. He did not, however, profit by training in skills for which he was apparently not developmentally ready. For example, though training in tricycle riding was instituted at eleven months, no progress was made until he was nineteen months of age.

Similar evidence of a relationship between the efficacy of practice and the developmental stage at which it is instituted is offered in another study in which the efficacy of early and later practice on climbing, buttoning, and cutting with scissors is compared (Hilgard, 1932). The subjects in this study were 20 nursery school children, divided into an experimental and control group, matched on the basis of age (24–36 months), mental age, and initial performance in the skills to be studied. One group T was given two periods of practice a week for twelve weeks in each of the skills studied, and was retested at approximately the end of each two weeks. At the end of this twelve week period, group C who had received no practice were first tested and then given four practice periods in a week and a retest. During this week, group T had no practice, but it was retested at the same time as group C.

Figure 45 based on performance scores summarizes the progress of these two groups. Hilgard interpreted the gains of the control group to mean that factors other than specific training contributed to the development of these three skills, factors which may be partly accounted for by maturation and partly by general practice in related skills. Hilgard also interpreted the more rapid gains in climbing scores in the T group during the later weeks of the experiment as evidence

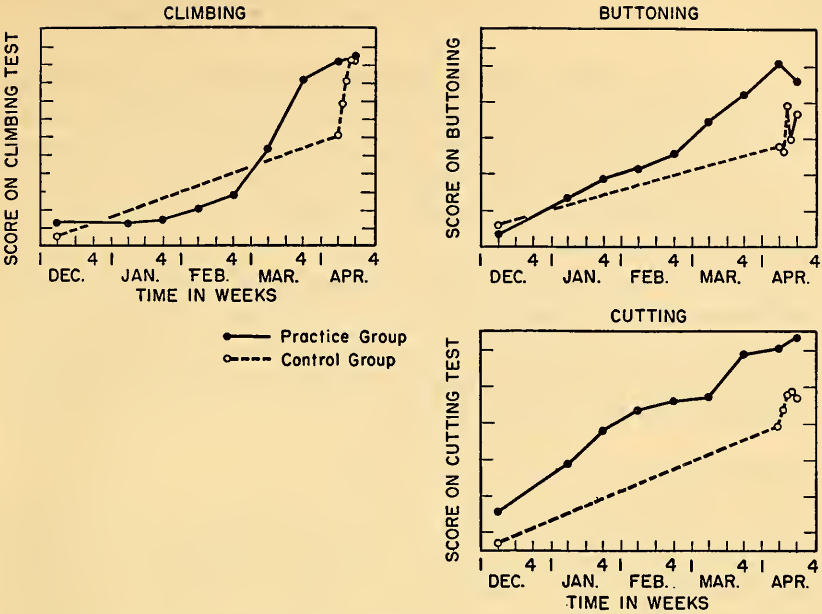

Figure 45. Performance in climbing, buttoning, and cutting in an experimental and a control group. From J. R. Hilgard, "Learning and Maturation in Preschool Children," *J. Genet. Psychol.*, 1932, *41*, 40–53.

that children gain more from practice as they become more mature.

This experiment raises methodological questions, which will be considered later, concerning what constitutes effective practice. Hilgard's subjects were all nursery school children. The group C that did not have practice in climbing, buttoning, and cutting may have had related experiences which achieved much the same result. Further, the control group had four practice periods in the week of testing, which raises another question of the effects of massed and distributed practice.

Despite flaws in experimental design, both studies suggest that the efficacy of practice in developing a specific motor skill is dependent on the subject's developmental readiness to profit by such practice.

Comparisons of the relative contributions of maturation and practice may make it appear that these are independent and mutually exclusive factors. Actually they cannot be separated because human beings do not mature in a vacuum: they grow up in a human environment which provides certain kinds of experience. The influence the environment of an animal species plays in educing the behavior potentialities of its young will be discussed in Chapter 9. Meanwhile it appears that maturation and practice have a reciprocal function. Mat-

uration makes learning possible, practice improves and expands activities of which the child is neuromuscularly capable. Though maturation is still a somewhat fuzzy concept, its implication of developmental factors or impulses within the organism modifying behavior is one of the most helpful contributions so far made to our understanding of young children's behavior.

Some studies (Hilgard, 1932) suggest that practice in related activities may have some effect on a child's performance in a specific motor activity. This brings up the questions of whether motor skills are interrelated and whether individuals exhibit a generalized motor talent or motor characteristics.

Motor talent vs. motor characteristics

The main argument for the existence of motor talent comes from the observation of an investigator (Shirley, 1931) who made the longitudinal study already noted on 25 infants during the first two years of their lives. Shirley noted that some infants seemed to be generally and persistently ahead of others on all types of motor performance. Other investigators recording children's performances in more standardized situations found interrelationships of performance scores which were too low to confirm the existence of a generalized motor talent.

For example, intercorrelations between test scores of young children in climbing steps and ladders, throwing, catching, and bouncing balls, hopping, skipping, balancing, and jumping reported in one study (McCaskill and Wellman, 1938, 98 children, 26–67 months) range from .40 to .84. In a more complete analysis of growth changes in motor abilities, another study (Bayley, 1935, 55 infants) offers intercorrelations between children's performances at succeeding ages on different test items in the California Infant Scale of Motor Development. Correlations between such categories of performance as motion and anti-gravity or postural responses are not consistent in their correlation with one another at different ages (r at 6 mos.=.31, at 27 mos.=.53), nor are the scores in either category at an early month predictive of scores in the same category at a later one.

These correlations suggest that under three years of age, relationships between motor performance are dependent on the components of the performance and that different components are involved at different ages. What are these components?

It would seem logical to expect that the body part involved in performances might furnish a common component in achievement. This however is not borne out by at least one study of the effect on

performance of the side of the body and the organs involved, when children performed different muscle skills requiring speed and dexterity—such as tapping a bell, with the right and left hand, right and left foot, and the fingers (Gates, 1931). Correlations between test scores revealed that for the particular activities studied, the side of body and the organ concerned had less effect on performance than the particular activity itself. For example, the average of correlations based on *different activities* performed by the same organ and sides of the body was .48. The average of correlations based on *different organs* on the same side of the body performing the same activity was .68. The average of correlations on *different sides of the body* involved in performing the same activity by the same organs was .75.

Attacking in a different way the problem of isolating common components in motor performances, another investigator (Goodenough, 1935, 20 children, 2½ years, 24 children, 3½ years, 30 children, 4½ years) analyzed correlations between test scores on the following performances: time required to walk a 25-foot line, number of errors made in walking 25-foot line, finger tapping with comptometer, time required to thread a series of five needles, three-hole test, tapping with stylus on metal plate with electrical counters, and simple reaction-time test.

Any test performance which correlated positively with performances on other tests was assumed to have something in common with them. By inspecting the correlations for evidence of this kind of relationship and by undertaking a statistical analysis (described in Chapter 13), two groups of interrelated test performances were distinguished. In each group it was assumed that a common factor was operating. A decrease with age in the extent to which one factor was operating suggested that this factor might be the maturity required to accomplish the performance. An increase with age in the operation of the other factor similarly suggested that the second factor might be the attention or carefulness required to perfect the performance. For instance, in walking the 25-foot line the 2½-year-olds took less time than the 3½- and 4½-year-old children, but they made more errors than the older children did.

In summary, the evidence available does not support conjectures of a general motor talent, but points rather to specific motor abilities. Higher correlations between performance scores in different skills for young children than for adults can be explained in terms of a common developmental factor affecting all performances of young children.

The range in magnitude of correlations between motor performance scores suggests that a playground for young children should

provide for different kinds and levels of skills, furnishing equal opportunities for carpenters and climbers, pedalers and pumpers, jumpers and throwers, so that all children may be able to enjoy the activities of which they are capable. For each skill there should also be provision for a range in performance: for throwing, a bean bag for the butter-fingered, a ball and a goal ring for the more adept; for balancing, a wide plank near the ground for wobblers, a narrow plank at a height for the more sure-footed.

Individual differences reported in motor performances and in such characteristics as strength and speed of performance prompt a question as to the part health and physical endowment play in motor development.

Health, Constitutional Characteristics, and Body Build in Relation to Development of Motor Skills

Health

Though it is a matter of popular belief that an individual's motor performance at any given time reflects his health and well-being at that time, a considerable number of problems have yet to be investigated before any adequate generalizations can be made on the effects of different kinds of illness of different degrees of severity, given different kinds of medical treatment in different individuals at different levels of motor development. About all that can be said at the present time is that minor health upsets in infants under optimal conditions of home and medical care do not affect the time of onset of sitting, creeping, and walking (Peatman and Higgons, 1940, 1942, 349 infants) and that there is a decrease in breathing capacity and in strength of young children during periods of lowered vitality.

This latter generalization comes from a study (Metheny, 1941) in which a drop of 2 cubic inches in breathing capacity and of 5 kilograms in grip strength occurring on the same or consecutive days offered some index of the likelihood of a child's acquiring a cold within a two-day period. Prediction on this basis missed 15 per cent of colds which occurred, and predicted three times as many colds as actually did occur. On the basis of this evidence the investigator concluded that reduction in breathing capacity and grip strength probably measured a fatigued condition in which a child is more susceptible to infection.

Constitutional Factors

Some association between congenital constitutional factors and motor characteristics is suggested in two studies. In one (Knopf, 1946),

muscle energy was rated in 689 infants during their first eight days of life. The ratings, which were made on a four-point scale, were in terms of resistance to force applied to infants' arms and legs. Distinguishable differences in this characteristic were found to persist during the period of study. For example, between the first and eighth day after birth only 13 per cent of the infants increased or decreased their rating score. In another study (Balint, 1948), instrumental records were made of the frequency and patterns of sucking rhythms of infants in a hospital. In the records of sucking rhythms as in those of muscle energy, persisting patterns of behavior were noted, suggesting the existence of congenital identifiable constitutional-cum-motor characteristics.

Body Build

As for body build, despite popular belief to the contrary, no significant relationships have been found between weight and height and age of walking. A relationship has however been established between rate of weight gain and sitting, walking, and creeping performance. In one study, infants showing rapid gain in weight over a fifty-day period developed motor skills at a lower rate than infants whose weight increase was more gradual (Welch, 1941). The explanation here would seem to be the same as that advanced for Johnny's loss of skill in roller skating after a four-year period during which he had no practice. Motor performances are apparently learned in terms of an individual's body proportions. When changes in body proportions take place rapidly, more adjustment is required in developing motor skills. They are therefore acquired more slowly.

An individual's inherited motor and constitutional characteristics and his pattern and level of development undoubtedly set limits to the performances of which he is capable at any age. Within these limits, exercise, training, or learning determine to what extent the individual realizes his motor potentialities. Let us therefore consider now which practice conditions are most productive in the development of particular skills.

Efficacy of Different Kinds of Practice

Repetition of Performance of Which Child Is Capable

Does a young child benefit from simply repeating a performance? Young children do, as we know, indulge in a great deal of repetitive

activity and they do show progressive improvement in some of the performances they repeat, but does improvement continue indefinitely or is there a point of diminishing returns? One study offers an answer to this question.

Sixty children ranging in age from 2.7 to 6.5 years were divided into a control and an experimental group matched on the basis of age, sex, IQ, and initial performance in throwing a ball at a moving target (Hicks, 1931). The experimental group were given practice once a week for eight weeks. Practice included praise and encouragement, but no instructions on how to throw. At the end of the eighth week, the practice and control groups were retested. Differences between the two groups were not significant. There was, however, evidence that the children with lower initial scores (girls vs. boys, and younger vs. older children) made relatively greater gains both with and without

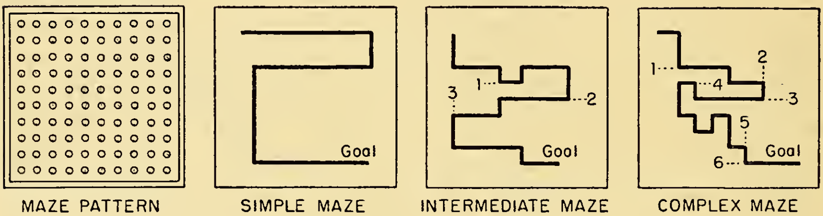

Figure 46. Maze patterns used to investigate the influence of maturation and practice in mastering performances of different complexity. From M. L. Mattson, "The Relation Between the Complexity of the Habit to Be Acquired and the Form of the Learning Curve in Young Children," *Genet. Psychol. Monogr.*, 1933, *13*, 299–398.

practice. Though none of the differences were significant their pattern was consistent. This pattern makes it clear that any generalizations concerning the efficacy of practice must be made in terms of a particular level of pre-practice skill in a particular performance.

Another study sought to relate effectiveness of practice to type of performance practiced. Children were given practice in operating rolling ball mazes of different levels of difficulty (Mattson, 1933, 50 children, 58–72 months). The children were divided into a practice and a control group matched for age, sex, IQ, and initial performance on operating a rolling ball maze. The experimental group were then given nine daily practice periods for 26 days in operating three rolling ball mazes of different degrees of difficulty. (See Figure 46.) The gains in mean time scores for the experimental and control groups at the

end of 26 days are also shown in Figure 47. From these it is apparent that the benefits of practice are related to the difficulty of the problem.

Both these studies suggest that practice of a purely repetitive sort does not necessarily make perfect, and that any generalizations con-

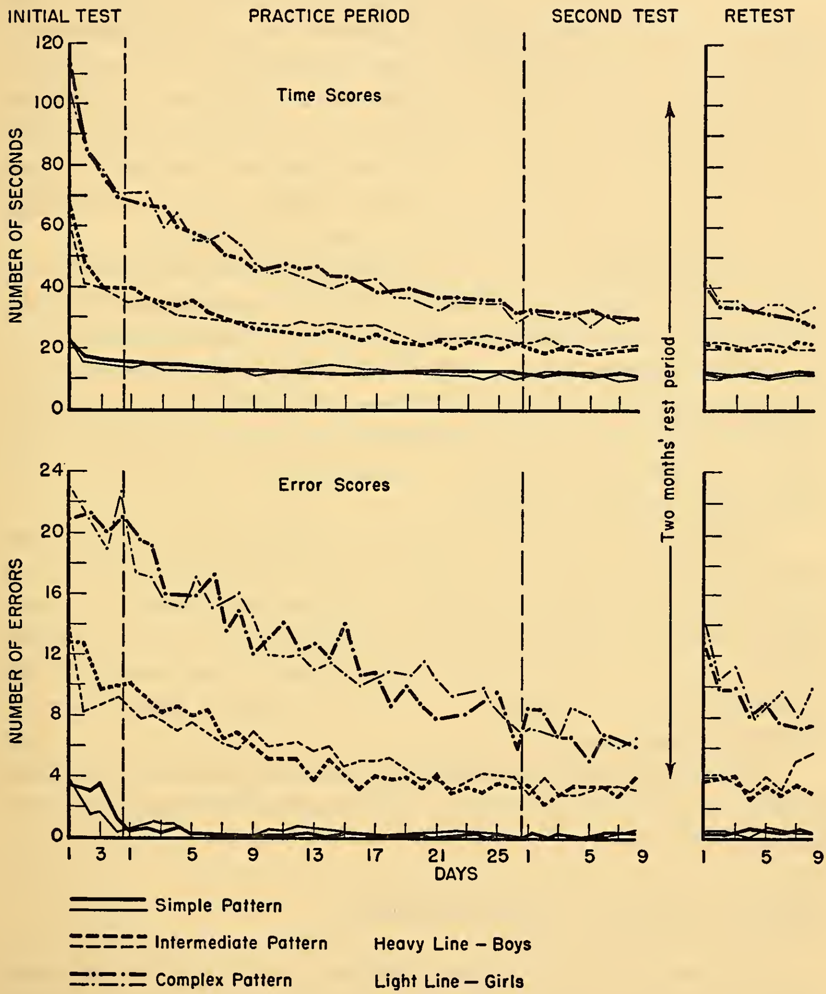

Figure 47. Learning curves for practice groups of maze patterns of different complexity. From M. L. Mattson, "The Relation Between the Complexity of the Habit to Be Acquired and the Form of the Learning Curve in Young Children," *Genet. Psychol. Monogr.*, 1933, *13*, 299–398.

cerning the efficacy of this kind of practice should be made in terms of a particular performance and a particular level of pre-practice skill. What of other kinds of practice?

Demonstration with Encouragement, Verbal Instructions and Kinesthetic Experience

In an investigation in which boys and girls were taught to toss rings over a peg (Goodenough, 1929), three types of guidance were compared. To one group of four boys and six girls the investigator said, "This is a game where we try to throw rings over a post. You stand here on this line. Be sure both your feet are on the line all the time and I'll hand you the rings. Try to throw them over the post. Do you see what I mean? All right, go ahead." Ringers were rewarded by praise, encouragement, and stickers to put on the wall.

To another group of two boys and four girls, an initial demonstration was given. This was followed by critical verbal guidance throughout. Sources of errors were pointed out—"not so far next time."

In a third group of two boys and two girls, the children received the guidance given the preceding group and also were required to adhere to a constant method of holding and throwing the ring. All three groups had twenty trials each for fifty days. Scoring was in terms of the number of ringers.

Median gains from the first to the fifteenth day were 36 per cent for the first group, 66 per cent for the second and 92 per cent for the third group. Though the number of subjects was too small for conclusive proof, this interesting experiment suggests that practice accompanied only by encouragement is relatively ineffective compared with demonstration accompanied by verbal instructions and a putting-through process.

Other studies suggest that the type of instructions and the method of demonstration are also important factors in a training or practice process.

Different Types of Verbal Instructions

In a study (McClure, 1936, 79 children, 27–70 months) in which children were given thirty instructions each of which required a motor response, fifteen of the instructions were either positive, specific, encouraging, suggestive, or unhurrying in character. The other fifteen were negative, generally discouraging, commanding, or hurrying. Comparisons based on critical ratios for the differences in responses

to positive vs. negative, specific vs. general, encouraging vs. discouraging, suggesting vs. commanding, and hurrying vs. unhurrying instructions suggest that the most generally helpful instructions were positive, specific, encouraging, suggesting, and unhurried. There were, however, differences in the responses of individual children which led the investigator to conclude—"human behavior is too variable to permit formulation of a fixed set of rules. The child's personality and the total situation must be considered."

The effectiveness of demonstration in motor practice is apparently dependent on the spatial orientation of the demonstrator and the child—a fact that will not be surprising to anyone who has had coaching in tennis or golf.

Spatial Orientation of Demonstrator and Subject

In an investigation (Emerson, 1931) of the effects of orientation on delayed reaction, 32 children ranging in age from 27 to 59 months were asked to imitate an experimenter's placement of a ring on one of a series of pegs on an easel. Five seconds after the experimenter placed the ring, the child was required to turn to a similar easel and place a ring over the corresponding peg. The placement of the child's easel necessitated nine degrees of reorientation, ranging from stepping to an easel alongside that of the experimenter to going round to an easel facing in the opposite direction.

With no disorientation the average number of correct responses was 17.82, with the first degree of disorientation the average score dropped to 6.25, and when the easels were back to back, the average score was only 1.81.

Therefore, if a child has to be shown how to put on his boots and tie his laces, sit down beside him rather than bending over him and work alongside rather than facing him.

The results from these studies suggest that benefits of practice are related to the particular kind of practice given, the particular skill practiced, and the level of maturity, pre-practice level of skill, and characteristics of the particular child involved. Simple skills in which a child already has a fair level of pre-practice skill show little improvement as a result of additional practice. Practice involving only repetition by a child is less effective than practice following demonstration by an adult, or practice directed by specific, encouraging, unhurrying verbal directions, or practice involving successful kinesthetic experience on the part of the child. As for demonstrations, these are more effective when both demonstrator and child have the same

physical orientation to the performance and when the demonstration is accompanied by statements which direct attention to the processes involved.

The implications from these generalizations for giving praise and encouragement and specific suggestions to any child attempting a new motor coordination, such as feeding or dressing himself, would seem obvious. Unfortunately it is in these very performances that many young children are most handicapped by negative, general, reproving, and hurrying directions.

As demonstration, praise, encouragement, and specific direction help children to develop motor skills not universally acquired by the human species, the selection of skills encouraged in any society is an important factor in young children's motor development.

Cultural Molding of Young Children's Motor Behavior

In simpler and more homogeneous societies than ours, the effects of cultural molding are more uniform and obvious than in the United States. In Bali, for instance, a photographic analysis (Bateson and Mead, 1942) of the behavior of adults and children reveals Balinese concern with spatial orientation and its symbolic significance. The photographs also reveal how this concern is perpetuated by selective restriction of young children's motor activities. To illustrate, to be spatially lower than another person is a socially inferior position; therefore, the young child is not permitted to crawl in public as progression on all fours would put him spatially and socially on an animal level. Rightness and leftness also has symbolic significance: the right hand is used for receiving food, the left for cleaning. Therefore, a Balinese mother forces the infant's use of his right hand in receiving objects. Ceremonial dance forms employ stylized movements that are learned in passive response to manipulation of the arm; therefore the Balinese mother fosters her infant's passive response by carrying him loosely in a sling which forces him to respond passively to every movement of her body. These and other motor adaptions reflect and perpetuate a way of life that Mead describes as a rhythmic patterned reality of pleasant significant movement centered in one's own body.

What of our own society? Preferential handedness appears to be, at least in part, the result of cultural influences. Sex differences in choice of play materials and play activities and in levels of motor skill also appear to be culturally conditioned. When 100 children aged one to six years were offered a choice of one of six toys—a small boy doll, small girl doll, horse, airplane, automobile, and powder box—only one

boy played with the girl doll, 70 per cent of the boys divided their choice between the two transportation toys; in contrast the majority of the girls chose a boy or girl doll and there was no sex difference in the time spent with the powder box (Benjamin, 1932). Though information is not available in this report concerning the play materials these particular children had in their homes, there is abundant evidence that, from the time a child's birth is announced with a red or blue ribboned card, parents select clothes and toys for their offspring in terms of their sex appropriateness.

Other evidence of the operation of cultural factors is to be found in the rewarding and indulging of sedentary behavior by television programs and automobile rides. To many children, physical inactivity is made to appear the ultimate juvenile virtue. Gadget manipulation of a fine-muscle push-button type is also rewarded by a variety of ingenious toys. Many young Americans are thus given considerable encouragement toward the life of sedentary onlookers controlling mechanical activity by the push of a button or the twist of a wrist.

A child's motor activity is of course, only one aspect of his behavior. How is it related to his development of language and understanding and to his social and emotional behavior and total personality organization?

Relationships Between Motor and Other Aspects of Behavior

Motor and Language Development

In the first days and weeks of life, vocalization is an accompaniment of mass activity. Together, vocalization and mass activity constitute the earliest form of social communication, being interpreted as evidence of hunger or discomfort. Even at three and four years of age a reported correlation of +.86 (Fisher, 1934) between the use of things by nursery school children and talking about things suggests a continuing relationship between speech and activity. This is also apparent in the vocal rhythmic chants with which young children accompany their hammering, pounding, rocking, or swinging in play groups.

Speech is also a substitute for action, as any person is sharply reminded when he tries to communicate his wants in a country whose language he does not speak. Learning this substitute is a gradual, progressive process. In the first year of life the child responds to ges-

tures before he does to words. He also uses gestures in communication more effectively than he does words. In the later years of early childhood he progressively eliminates supplementary gestures as his command of speech increases. He also has less need of gestures by adults to grasp the content of their communications.

As illustration, in a study of social contacts of nursery school children (Sibley, 1945), three-year-olds were found to use relatively more gestures and less language in their contacts than four-year-olds. In a study of teacher-child contacts (Landreth, 1943) in the same group, the teachers were found to employ more gestures in communicating with three-year-olds than they did with four-year-olds.

There is also evidence that language and motor skill develop to some extent at each other's expense. There is for instance a drop in vocabulary gains during the 15–18 months age period when children are making rapid progress in developing motor skills (Smith, 1926), though a correlation of +.39 (Bayley, 1935) between age of walking and age of talking suggests that children at this age are ready to make gains in both performances. What happens, therefore, appears to be that one skill—upright progression—takes place at the expense of another—speech. Sex differences in language development in favor of girls, and in motor skills in favor of boys, offer further support for this generalization.

A relationship between handedness and speech, already discussed, is likewise undeniable though its exact relationship is not as yet completely understood.

Motor and speech behavior are therefore closely related, in fact almost undifferentiated, in the activity pattern of the first days of life. Speech *is* a motor activity, it is an accompaniment of and a substitute for motor activity, and the development of both speech and motor behavior reflects the operation of a common maturational process. Further, in early stages of development, learning in one takes place at the expense of learning in the other.

Interrelationships Between Motor and Emotional Behavior

Two studies suggest a reciprocal action between motor behavior and emotional behavior or feelings. One (Ames, 1949) reports the most frequent cause of smiling in children aged 18 to 48 months to be the child's own activity. Another (Goodenough and Brian, 1929) notes that children in a ring peg test showed a tendency to overthrow immediately after making a ringer. Activity, therefore, pro-

motes well-being, and well-being and success lead to expansive action.

Other evidence that a child's well-being is promoted by exercising his developing motor skills is offered in Shirley and McGraw's observation that young children's play is a repetition of their newly acquired or developing skills. This, in turn, suggests that young children should be provided with acceptable means of exercising emerging skills. But are they?

Recently I was making an afternoon call on a new faculty family. There were two other callers. As the ladies sat comfortably slumped in overstuffed chairs, the fifteen-months-old son was brought in from his nap. He had just started walking a few days earlier and now, refreshed by sleep, was eager to get afoot in the large living room with its thick pile carpet. He was happily lurching from chair to chair with an occasional clutch at the furniture when tea was brought in. Then he was briskly picked up and popped into a 3 × 4 foot playpen. A kitchen strainer was dropped in alongside him. The boy, apparently a child of spirit, flung the strainer into the room, and literally howled with rage. "Got a temper," said one of the childless callers. What this child had was a legitimate grievance. A large space admirably suited to the safe development of upright locomotion was being monopolized by four middle-aged ladies, none of whom showed any intention of more vigorous activity than stirring her tea. If the persons present had to be divided into those confined and those free, clearly a developmentally informed justice would have reversed their positions.

Similarly, after World War II, a returned soldier wrote of his chagrin in finding that his eighteen-months-old son rejected his advances and showed marked preference for his grandfather. After abortive attempts to engage his young son in roughhousing and various manly activities, the veteran studied the grandfather-child interaction. When grandfather lighted his pipe, he held the match out for his grandson to blow out; when lights had to be turned on, he held the little boy up to snap the switch. Further, he did not arbitrarily break into and disrupt the child's activities. Those he shared were ones suited to the grandchild's interests and level of development.

Surely no observant adult need wait until he is a grandparent to find out what activities a young child is ready for and itching to perform. And yet, some adults never do find out, particularly those in charge of public transportation systems which offer reduced fares on rail, plane, and bus for children under two years to travel "in arms." As any of the traveling public can testify, most children between 6 and 24 months of age are only briefly and reluctantly in anyone's arms. What they need is ranging space, not a lap.

In summary, motor activity plays so large a part in the life of the young child that at times it both promotes and reveals his satisfaction with attendant circumstances. In particular, exercising the skills of which he is newly capable appears to contribute to his emotional well-being. However, in the first flush of activity for its own sake, many if not most young children in our society endure considerable frustration because of lack of observation and initiative on the part of adults. It is, therefore, reasonable to assume that there will be some relationship between a child's motor and social behavior.

Relationships Between Motor and Social Behavior

Relationships between motor and social behavior are suggested in two studies. In one (Jack, 1934), young children in a nursery school and an experimental situation were rated on their socially assertive or ascendant behavior. Those found least ascendant increased in ascendancy following a period of training in motor performances used in play. Whether their social confidence resulted from the skills per se or from the encouragement and attention given them during the training process is of course open to question.

In another study, Johnson (1935) compared the social behavior of nursery school children on a well-equipped playground with their behavior when half the equipment was removed and found a significant increase in asocial play and physical assault. The reason would seem obvious. The children apparently solved the shortage by using each other as equipment.

Similarly, some years ago when the W.P.A. nursery schools were in their last months of operation, a nursery school director was asked to determine why the children were engaging in "sex play." A glance at the nursery school yard revealed the major reason for this activity. In the last days of W.P.A. nursery schools, the only staff members still eligible for employment were middle-aged. Being no longer agile and able to get quickly from one spot to another, they had reduced to a minimum all equipment involving any possible physical hazard. The children, faced with this shortage, had taken the obvious recourse in exploring the possibilities of interesting activity in their own persons.

Motor activity, then, is so much a part of young children's social activities that competence in motor skills used in play activities contributes to social assurance. Lack of outlet for motor activity and object manipulation in a group of children likewise leads to interpersonal manipulation and conflicts over scarce equipment.

Because motor activity is a dominant feature of children's be-

havior, it is reasonable to suppose that its development is also related to the growth of understanding.

Motor and Mental Development

One way of relating motor and mental development is to compare children's performances on motor and mental tests. In one such comparison, correlations of approximately .5 were obtained for the first fifteen months of life (Bayley, 1935). There was also a correlation of .4 between age of first walking and mental test scores at three years of age.

What do these relationships mean? They could mean merely that mental tests for the early months of life test motor as well as mental functions: as illustration, a test item for the California First Year Mental Scale is "builds a tower of two cubes." Another correlation of .39 between age of walking and age of talking suggests, however, that these relationships may also reflect a common developmental component. Aside from the influence of this developmental component, behavior is also influenced by the child's experiences. The young young child learns from first-hand experience. First-hand experience requires mobility and manipulative skill. Travel, even on all fours in the living room, is therefore a broadening intellectual experience.

Motor and mental activity are interrelated in other ways. Studies on problem solving in children and adults show that young children resort to more overt trial and error than older children and adults (Harter, 1930). The older child or adult can consider and decide against many moves; the young child to a greater extent must substitute motor activity for mental activity. He tests life in his muscles and much of what he learns about it is in terms of action responses rather than verbal generalizations. Thus, when he solves a problem by his actions, he is often unable to tell why he took those particular actions (Heidbreder, 1928). Further, memories and impressions revealed in actions are often never formulated in words.

For example, recently in a nursery school a delivery truck got stuck in some soft mud in a neighboring lot. Next day the children reenacted in pantomime with a wealth of minute and accurate detail the entire action of what they referred to simply as "stuck in the mud!" On another day, a three-year-old backed himself into a small rabbit hutch. Though closely confined, he gave a remarkable facsimile of rabbit behavior that revealed a wealth of sound observation.

The major part that movement plays in the child's thought, feeling, and social communications thus suggests its importance in early

childhood education. The child is a laboratory student, not a library one, an actor rather than a speaker. Sensori-motor experiences must therefore be given a large part in prekindergarten education. In experimental studies also, the motor character of young children's behavior must be taken into account and opportunity provided for doing as well as for saying.

Review

Motor activities which distinguish the human species, such as upright walking and fine hand and finger coordinations, follow an orderly sequential course of development whose rate is little affected by environmental factors. These characteristics suggest the operation of forces within the organism which are currently referred to as developmental or maturational factors.

In the period following onset of walking, large muscle motor skills of young children show age and sex differences in favor of boys. As children grow older they tend to incorporate motor skills into play projects rather than simply repeating performances. Throughout the period of early childhood, however, the urges to practice emerging motor skills and to manipulate objects are enduring and distinguishing characteristics.

The effect of practice on motor skills is dependent on the kind of skill and the kind of practice as well as on the child's level of development and pre-practice performance.

An increase in right handedness with age and its higher incidence in taught than untaught activities suggest that social factors play a large part in its development.

Interrelationships between levels of performance in motor, mental, and language development are traceable to their common maturational components. The major part motor activity plays in the young child's life is reflected in the child's use of overt actions rather than reasoning processes to solve problems, in his use of gestures as substitutes and accompaniments for words, in the relationships between his motor competence and social assurance, and in the ways in which his motor activity both reveals and promotes "feelings" or emotions.

Recommended Reading

The following sections in *Readings in Child Psychology*, edited by Wayne Dennis (New York: Prentice-Hall, 1951), contain brief accounts

by the investigators of some of the basic research in motor development in early childhood: pp. 68–72, Shinn, M. W., "Motor development of four infants"; pp. 85–96, Shirley, M. M., "A longitudinal study of the motor sequence"; pp. 104–31, Dennis, W., and M. G. Dennis, "Development under controlled environmental conditions"; pp. 132–42, Peatman, J. G., and R. A. Higgons, "Relation of infants' weight and body build to locomotor development"; pp. 167–79, Hilgard, J. R., "Learning and maturation in preschool children"; pp. 199–223, McGraw, M. B., "Later development of children specially trained during infancy."

See also the following section in *Psychological Studies of Human Development*, edited by Raymond G. Kuhlen and George G. Thompson (New York: Appleton-Century-Crofts, 1952): pp. 16–24, Gesell, A., and H. Thompson, "Growth patterns of identical twins."

Recommended Films

"Development of locomotion." Silent, 10 mins.
Developmental sequences depicted in infants from 6 to 16 months of age. The same individuals appear in repeated pictures showing month to month gains.
N. Bayley and H. E. Jones
Institute of Child Welfare, University of California

"From creeping to walking." Sound, 10 mins.
Analyzes mechanics of locomotion and stages by which infant attains an upright walking posture.
Narration by Dr. A. Gesell.
Encyclopedia Britannica in collaboration with Dr. A. Gesell.

"Growth, a study of Johnny and Jimmy." Silent, 45 mins.
Illustrates effectively the influence of exercise on each motor function at each age level and the complex interdependence of practice and maturation.
Warden and Gilbert
International Film Bureau

"Large muscle skills of four years olds." Silent, color, 12 mins.
Prepared in the Institute of Child Welfare nursery school. Individual sequences that show running, balancing, jumping, pedaling, pumping, kicking, throwing, catching and bouncing, hitting and punching, pushing and pulling, climbing, suspending own weight, tumbling, and steering wagons indicate the types and levels of large muscle skills that are characteristic of children this age.
C. Landreth and G. J. Gardner
Institute of Child Welfare, University of California

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Chapter **5**

THE DEVELOPMENT OF LANGUAGE AND THE FUNCTION OF SPEECH IN EARLY CHILDHOOD

Is there any speech development prior to the first spoken word?

Is late talking a sign of mental retardation; is early talking an indication of mental acceleration?

How does a child acquire his first spoken word?

Who would you expect to have larger vocabularies: children of university professors or children of unskilled workers, children in orphanages or children in family homes?

What are the possible means of measuring and comparing young children's vocabularies?

Do boys or girls have better language development in early childhood?

What can adults do to foster young children's understanding and use of speech?

THE BABY'S FIRST WORD is a household event, ranking in importance with his first steps alone. The first recognizable word is not, of course, the point of origin of the baby's interest in and experimentation with vocal sounds. From the moment of his birth, which is literally announced by his cry, the infant communicates his satisfaction or dissatisfaction with his circumstances to attentive adult ears. Adult responses to these vocalizations establish their function as a means of communication. Adult vocalizations accompanying comforting attention to the infant similarly establish the role of speech in close human contact. Little wonder that the maturing infant pays selective attention to vocal sounds or that he imitates them to develop a more sensitive medium of communication with the people in his world.

As his speech develops through preverbal and verbal stages, it serves many functions. It expresses generalized emotions and specific feelings; it is muscular activity for its own sake; it is a sound accompaniment and a substitute for muscular activity, extending the range of the child's influence beyond his immediate physical efforts; it is a source of sensory pleasure and means of recalling sensory impressions; it establishes identity with others and expresses the uniqueness of the child's individuality; it communicates ideas, wishes, and needs and makes possible the recall of objects, persons, and events not present; it is a means of organizing, classifying, and relating impressions; it is markedly affected by the particular situation in which it occurs and often serves several functions simultaneously.

This complexity of functions makes language difficult to study and probably accounts for the fact that so far more research has been directed to the content and form of young children's speech than to its function. Let us therefore consider first what the child says and how he says it.

Content and Form of Young Children's Speech

WE ARE immediately confronted with a large number of investigations devoted to classifying and appraising early speech efforts in terms of adult usage in our society. The emphasis in these studies is for the most part on language as an institution rather than on speech as a form of behavior. One of the problems studied from

this viewpoint is the infant's progress in acquiring the sounds used in adult speech.

Preverbal Speech

Before 1940 descriptions of speech sounds of infants were largely in barnyard terms. Infants were reported as grunting, mewing, cooing, crowing, and squealing. Reports were based on small numbers of infants—often only one—; no systematic research methods were formulated, no measures of agreement between observers reported, and no statistical analyses employed.

Current Methods of Studying Preverbal Vocalization

During the forties a precise and reliable means of recording and analyzing the speech sounds of infants and young children was developed (Irwin, et al., 1941a,b), in which a single respiration was used as a behavior unit and vocalizations were recorded in terms of the frequency per breath sample of different types of sounds in the International Phonetic Alphabet. Agreement between independent recorders of these sounds in the same breath sample was over 90 per cent.

Using this method of recording, a series of studies was undertaken to determine what part developmental, environmental, and native factors play in the development of sounds used in adult speech.

Factors Associated with Frequency of Vocalizing

It is probably no surprise to learn that infants vocalize more as they get older (Irwin, 1947c) and that among infants the same age some are more vocal and some more silent than others. What is perhaps less widely known is that there is a relationship between infants' vocalizing and their environmental circumstances. It has been found, for instance, that infants in institutions vocalize less per breath sample during the first six months of life than those in family homes (Brodbeck, 1946). It has also been found that infants of laboring parents make fewer sounds per breath sample than those of parents engaged in professions, though these differences do not occur until children are between 18 and 30 months of age (Irwin, 1948b), (see Figure 48).

Factors Associated with Phonetic Content of Infant Vocalizations

In the first days of life, the sounds most frequently made by infants are the vowels ɛ, ɪ, ʌ, and the consonants, *g*, *k*, and *l*. An explana-

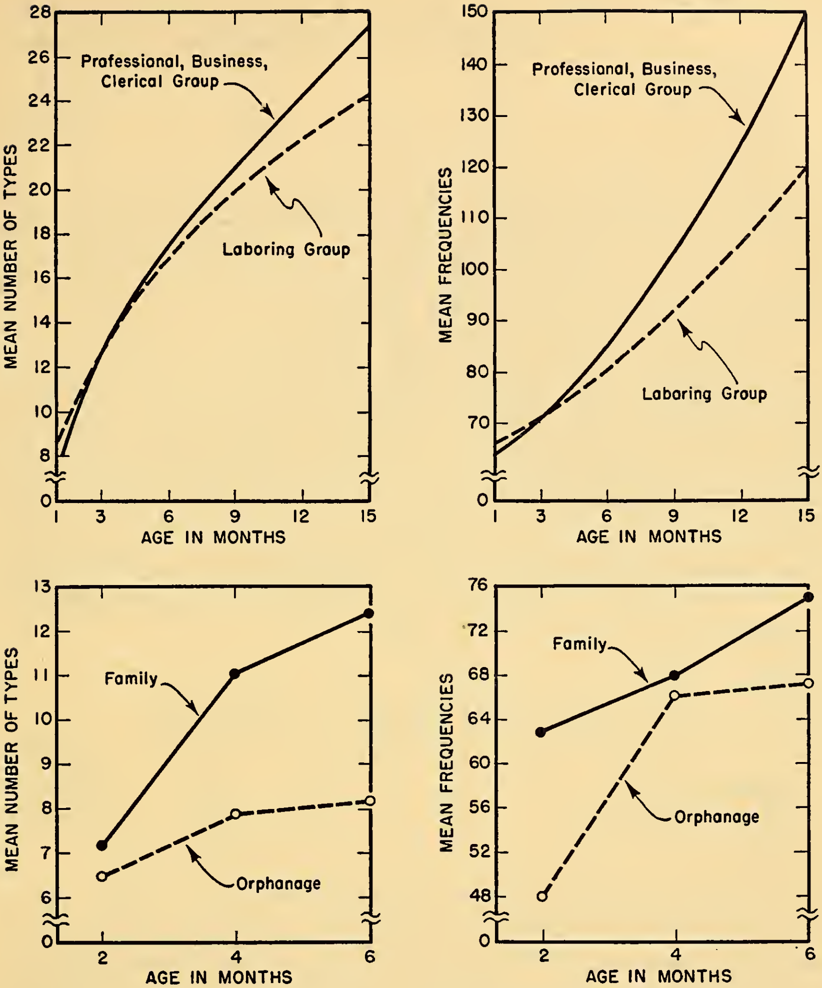

Figure 48. Mean frequencies of vocalizing and mean numbers of types of sounds in the vocalizing of infants of laboring and professional parents and of infants in homes and institutions. From O. C. Irwin, "Infant Speech," *J. Speech and Hearing Disorders,* 1948, *13,* 224–225 and 320–326, and from A. J. Brodbeck and O. C. Irwin, "The Speech Behavior of Infants Without Families," *Child Development,* 1946, *17,* 145–156.

tion of why these particular sounds are made is that they are produced in sucking and swallowing. With increasing age the infant develops an increasing number of sounds in his vocal repertoire. Throughout infancy, however, the phonetic content of his vocalizing differs from that of adult speech in several ways. For instance, the infant not only has fewer vowels and consonants in his repertoire, he has them in different proportions as the summary below shows (Chen, 1946a,b,c).

	Vowels *Average No.*	*Consonants* *Average No.*	*Ratio*
Newborn	2.7	2.2	3 to 2
Infant, 30 mos.	13.0	16.0	1 to 1.2
Adults	13.0	24.0	1 to 2

With increasing age the proportion of vowels decreases; the proportion of consonants increases. This is not surprising when one reflects that many consonants are sounds any individual literally has to get his teeth into. There are also changes with age in the proportions of different types of vowels and consonants.

To illustrate, when vowel sounds are classified according to place of articulation as front, middle, and back vowels, it is found that front vowels are more frequently used by the newborn than middle and back ones. Among more than 1,000 vowel sounds recorded phonetically for 40 babies observed during the first 10 days of life, 92 per cent were front vowels, 7 per cent middle vowels and only 1 per cent back vowels. By six months of age, as the summary below shows, there is a reduction in the percentage of front vowels and an increase in middle and back ones (Irwin, 1948a).

	Front Vowels %	*Middle and Back Vowels* %	*Ratio*
1 month infants	80	20	4 to 1
6 months infants	55	45	1 to 1
adults	49	51	1 to 1

When consonant sounds are similarly classified according to place and manner of articulation, developmental differences are also found in the proportion of different types present at succeeding ages. The back consonants, *g*, *k*, and *l*, predominate in the first weeks of life, the front consonants, *m*, *b*, and *p* appear later (Irwin, 1947a, 1947b, 1951).

The rate at which an infant acquires the types and proportions of vowel and consonant sounds characteristic of adult speech is, like the frequency of his vocalizing, affected by environmental as well as developmental factors. Infants of parents engaged in manual labor make slower progress, during the age period 18 to 30 months, than those of parents in professions (Irwin, 1948b). (See Figure 48.) Infants in institutions make slower progress even during the first six months of life than those in homes (Brodbeck, 1946). (See Figure 48.)

Reasons for these differences, which are important factors in the child's socialization and intellectual development, will be considered later in reviewing the part native and environmental factors play in

the development of speech. Meanwhile let us consider how these early speech sounds are replaced by recognizable words.

Development of the First Recognizable Word

It is widely noted that the infant responds to speech with speech and to intonation with intonation. It is therefore reasonable to assume that adult intervention into an infant's babbling plays a large part in the selective use of certain sounds in certain situations.

For example, an infant repeating *dada* is stimulated in its repetition by the sound of his own voice and by the muscle sensations involved in making the sound. When an adult also says *dada* at the same time, the associated stimulus of the adult's syllables may eventually become a substitute stimulus to which the child responds with *dada.* If the adult only says *dada* when the visual stimulus of a man is present, then after a period of responding to associated visual and auditory stimuli—"man present, adult says *dada*"—the infant may finally say *dada* in response to "man present" because of the rewarding attention this provides him. (See Figure 49.)

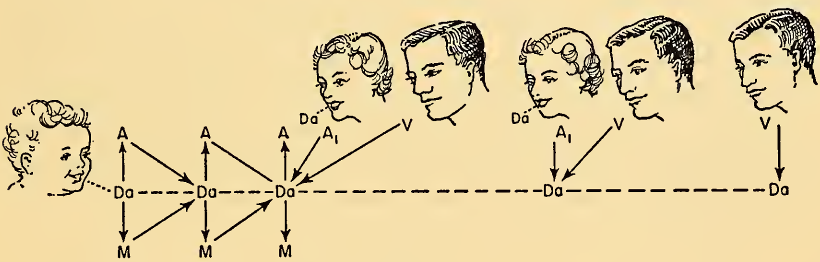

Figure 49. Acquiring the first word.

Verbal Speech

Once the young child is speaking words, the content or size of his vocabulary becomes a matter of interest in gauging how much he understands of what he hears and how much he can communicate of what he feels and thinks. Determining the content of his vocabulary is however beset by many methodological problems.

Methodological Problems in Vocabulary Determination: Word Definition

First there is the problem of what constitutes a word. Are plurals to be counted separately, are different parts of speech with the same

root (*merry* and *merrily*) to be treated as separate words, and what is to be done about comparatives and superlatives (*big, bigger, biggest*) and contractions (*won't* and *can't*)?

Definition of Vocabulary Ability

Then, some decision must be made about the vocabulary ability to be measured. Is a child to be credited with words he gives evidence of understanding or only with those he uses? Is he to be credited with knowing a word if he uses it at all, or must he give evidence of appreciating the varying shades of meaning a word conveys in different contexts? It would be an impossible task to record every word used or understood by a group of children. Therefore vocabulary estimates must be based on children's use or comprehension of test words.

Selection of Test Words

As only a limited number of test words can be elicited or responded to before a young child tires and ceases to cooperate, the words chosen must represent a range of difficulty or a sampling of words commonly used by young children. Two word lists from which such test samples are derived are the Kindergarten and Thorndike Word List. The Kindergarten List (Horn, 1928) was obtained by recording the words commonly used by over 3,000 kindergarten children in Western, Southern, Midwestern, and Eastern states and arranging 7,000 words obtained by these means in descending order of fre-

TABLE 5

METHOD OF SELECTING 50 TEST WORDS FROM A 7000-WORD LIST

(Each square represents approximately 75 words. Those containing 1 indicate 1 word had been chosen from the 75.)

(*From Van Alstyne, D. 1929*)

															No. of Words
1st 1,000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
2nd 1,000	1	1	1	1		1	1	1	1		1	1	1	1	12
3rd 1,000		1	1		1	1		1	1		1	1		1	9
4th 1,000	1			1			1			1			1		5
5th 1,000		1				1				1				1	4
6th 1,000	1						1						1		3
7th 1,000	1						1						1		3
Total															50

quency. The Thorndike List (Thorndike, 1931, 1932) represents 10,-000 words used by adults in writing for children.

To illustrate how such lists may be sampled, Table 5 shows the regular order of frequency on which a sampling of the Kindergarten Word List was based in one study (Van Alstyne, 1929). Each column represents approximately 75 words. Each line represents 1,000 words. The first line represents the 1,000 words used most frequently, the last line the 1,000 words used least frequently. Nouns and verbs occur in this list in a slightly less than 3 to 1 ratio. As this is also the ratio represented in individual vocabularies of young children (Mateer, 1908) and in the dictionary as a whole, the 50 words selected conform to this ratio by including 36 nouns and 14 verbs.

Once a list of test words is prepared, the next problem is the method of testing the children.

Method of Administering Test

Illustrating again how this may be done, in a study of children's *understood* vocabulary (Van Alstyne, 1929), children were presented with a series of cards containing four line drawings each representing an act or object and asked to point to the one named by the tester. Such simple questions as "Show me the _____," were used in the case of nouns, and "Show me the boy who is _____," in the case of verbs. As Table 6 below indicates, the other three of the four words from

TABLE 6

A SAMPLE OF SIX OF THE FOUR-WORD COMBINATIONS ILLUSTRATED BY LINE DRAWINGS IN THE VAN ALSTYNE PICTURE VOCABULARY TEST

scissors	knife	strawberry	turkey
duck	rabbit	*pig*	pen
hatchet	brush	policeman	*hammer*
can	slide	*box*	book
bag	pumpkin	window	*bread*

which the child was asked to choose were selected on the following basis:

1. At least one word fell in the same frequency list as the test word and hence was of equal difficulty.
2. At least one word was associated with the test word in life situations, e.g. *thimble* with *needle*.
3. At least one word sounded somewhat the same as the test word.

In the study of *spoken* vocabulary, words were elicited from the children by the use of pictures, toys, and questions, presented in a standard and systematic order (Smith, 1926).

From this account it will be clear that what is obtained in vocabulary determinations is not a total vocabulary score, but a vocabulary index. This index is, as we shall see later, most useful in comparing vocabulary development in children of different ages and social environments and in relating vocabulary to other aspects of development such as mental test performance.

Some vocabulary tests, such as the Full Range Picture Vocabulary Test (Ammons, 1949), have been standardized by testing equal numbers (15 at each age) of boys and girls whose parents' occupations are representative of the distribution in the latest United States Census. When a test such as this is used, it is also possible to compare a child's performance with that of other children his age.

The form and content of a child's speech has other characteristics than the number of words he understands and uses correctly. Studies have therefore been made of the fluency and loquacity of young children and of the comprehensibility and grammatical characteristics of their speech.

Fluency

Word fluency is defined as the ability to think of isolated words at a rapid rate and to produce or manipulate words in accordance with a specified set. Successful scrabble players and crossword puzzle workers undoubtedly rank high in this ability. What about young children?

In a study involving 38 five- and six-year-olds largely drawn from a professional occupation group (Gewirtz, 1948a,b), a variety of test items was employed including rhyming and alliterative responses to test words, responses to "in the," responses to requests for child names, adult names, and thing names, straightening out a disarranged sentence, and output of words in speaking on a familiar topic.

Intercorrelations between performance scores on these test items ranged from .04 to .70, suggesting that the items tested somewhat different abilities, one of which might be the rate of word association with some restrictions and the other the rate of word association with no restrictions. Correlations of fluency scores with spoken vocabulary scores were higher than with understood vocabulary. For example, the rhyming scores correlated .76 with spoken[1] vocabulary scores, .56 with Stanford Binet vocabulary sub-test scores. Correlations were incidentally both higher and more significant between fluency and mental age scores than between fluency and chronological age.

[1] The Smith Williams vocabulary test is based on children's correct use of 43 test words. Stanford Binet items are based on word comprehension.

There was also evidence that one fluency factor might be associated with temperamental characteristics. As illustration, correlations between the various word-fluency test scores and ratings on eleven personality characteristics—aggressiveness, cheerfulness, competitiveness, conformity, curiosity, emotional control, emotional excitability, gregariousness, originality, patience, and social apprehensiveness showed a correlation of .56 between competitiveness and rhyming and .58 between curiosity and rhyming.

Though many of the personality characteristics which exhibit significant relationships with fluency scores are also correlated with chronological and mental maturity, the array of correlations makes it clear that speech characteristics become more meaningful when considered in terms of the total personality. In this instance it may be that speed of verbal reaction is related to emotional characteristics in somewhat the same way as speed of motor reaction (described in Chapter 4).

In using words some children are more voluble than others. Is loquacity related to command of vocabulary, to age, and to intellectual functioning?

Loquacity

Investigations recording the quantity of children's speech within a given time interval all agree in reporting wide individual differences within each age group. For example, in a study in which 50 consecutive remarks of 120 children were recorded, the length of time required to produce these remarks varied from 7 to 50 minutes (McCarthy, 1930). In another study in which the remarks of 72 nursery school children were recorded during 9 hours of free play, the number of remarks per child per hour ranged from 23 to 192 (Fisher, 1934).

There are age as well as individual differences. Two investigators (Brandenburgs, 1915, 1916) reported their daughter using 11,623 words in a day at 40 months of age, 14,930 words at 52 months of age. In line with this finding, the number of words per hour used by the group of nursery school children referred to above correlated .56 with their chronological age.

The relationship between loquacity and vocabulary has been touched on in a comparison of the total and different words used by children of different ages during a nursery school morning (Jersild, 1938). As Figure 50 shows, increases with age in the total number of words used in conversation with other children are greater than increases in the number of different words. A reasonable ex-

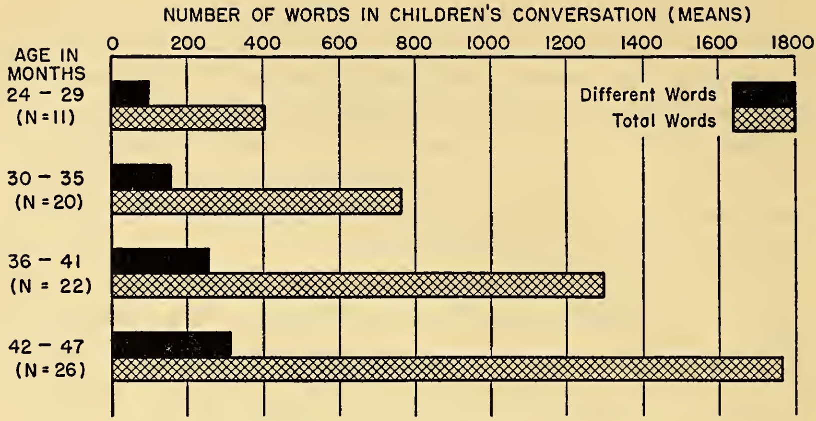

Figure 50. Total and different words in the conversation of nursery school children. From A. L. Jersild and R. Ritzman, "Aspects of Language Development: The Growth of Loquacity and Vocabulary," *Child Develpm.*, 1938, *9*, 243–259.

planation of this observation is that as children grow older and use adult sentence construction, more pronouns and articles occur in their speech and hence less of their total vocabulary is employed. It would, therefore, be of interest to compare children's performance on a spoken vocabulary test with a measure of their loquacity. As for the relationship between loquacity and mental functioning, an analysis (Fisher, 1934) which reports a correlation of .20 between amount of talking and mental test performance suggests that with adults as with children, the gabby are not necessarily the gifted.

Effective speech requires in addition to an adequate vocabulary the ability to speak comprehensibly and to combine words grammatically. What information is available concerning these matters?

Comprehensibility

We all know that most young children speak more intelligibly as they grow older and that some are easier to understand than others. The relationship between age and articulation is illustrated in an analysis (McCarthy, 1930) of 50 remarks or responses obtained from each of 140 children. The responses were elicited in the children's homes by means of books, pictures, and toys. The children included 10 boys and 10 girls at each six-months age interval from 18 to 54 months; and their parents' occupations represented an occupational cross-section of the city in which they lived. Twenty-six per cent of the eighteen-months-old children's remarks were comprehensible compared with 93 per cent of the three-year-olds.

Other evidence of a relationship between age and articulation comes from a study of the accuracy of children's articulation of 133 sounds (including consonant elements, consonant blends, vowels, and diphthongs), (Wellman, 1931). These sounds were elicited from 204 children, 2 to 6 years of age in response to pictures and were recorded in the symbols of the International Phonetic Alphabet. A correlation of .80 was obtained between articulation and chronological age.

As children grow older, they not only use less incomprehensible non-verbal speech, they use it under different circumstances and for different purposes than they did at an earlier age. For instance, in an analysis of nursery school children's conversation, (Fisher, 1934, 9 hours conversation for each of 72 children) the non-verbal remarks of the four-year-olds occurred mainly in dramatic play. In this connection it would be interesting to know under what circumstances and for what purposes adults lapse into the *huhs*, *uhuhs*, and *hmms* that besprinkle some of their speech.

Sex and parental occupation, as well as age, are factors in the comprehensibility of children's speech. In studies so far reported, girls' speech was slightly more comprehensible than that of boys, and children of parents engaged in professions spoke more comprehensibly than those of parents in unskilled occupations.

A child's ability to articulate is also related to other aspects of his development of language. Table 7, which presents intercorrelations

TABLE 7

CORRELATIONS OF SEVERAL LANGUAGE INDICES WITH CHRONOLOGICAL AGE, MENTAL AGE, AND INTERCORRELATIONS AMONG THE LANGUAGE VARIABLES

(*After Williams, 1937a*)

N = 38	MA	Speech sounds	Word usage	Length of unit	Completeness	Complexity	Van Alstyne vocabulary	Smith-Williams vocabulary
CA	.56	.31	.43	.54	.41	.45	.36	.16
MA		.12	.49	.78	.55	.59	.52	.47
Speech sounds		**.91**	.64	.60	.61	.62	.16	.01
Word usage		.60	**.94**	.62	.80	.57	.36	.27
Length of unit		.69	.42	**.86**	.65	.80	.56	.37
Completeness		.58	.66	.41	**.89**	.74	.41	.21
Complexity		.60	.38	.67	.61	**.87**	.56	.41
Van Alstyne vocabulary		.57	.13	.28	.16	.36	**.84**	.59
Smith-Williams vocabulary		.08	.09	.04	.02	.22	.76	**.87**

between different measures of language development in 38 three- and four-year-old children (Williams, 1937a,b), shows correlations between scores for articulation and length of response, completeness

and complexity of response, and correct word usage ranging from .60 to .64. These correlations suggest either that poor articulators practice less because their speech is unsatisfactory, or that factors contributing to poor articulation also contribute to other aspects of lingual expression.

Length of Conversational Unit

Young children are commendably brief in their statements, relying on reiteration rather than elaboration to make their points. The three-year-old child who, as his nap hour approaches, looks his mother in the eye and says "no sleep today" combines in three words a statement of fact and feeling and an ultimatum that is generally more telling than the adult syntax with which such a statement is usually greeted.

The length of unit increases with age: in one study (McCarthy, 1930), from 1.2 words per response at 18 months to 4.6 words at 54 months. Girls use a slightly, but not significantly, greater number of words per response than boys. The difference here is explainable in terms of girls' greater social conformity and closer identity with their speech-pattern source—their mother.

As with other indices of language development, the occupation of children's parents is a factor in the length of their response. In one study (McCarthy, 1930), the mean number of words per response for children of unskilled workers was 2.4, for children of parents engaged in professions, 6.3 words.

Age of associates as well as parental occupation is related to length of response. Not only was a shorter response obtained for children who associated mostly with other children, the average response was found to be even shorter in twins (Day, 1932) and still more short in triplets (Howard, 1934). The most reasonable explanation of these differences would seem to be that in speech, as in tennis, a novice makes more progress in association with an expert than with another novice. (See Figure 51.)

Analyses of samples of young children's conversation show similar age, sex, and occupational group relationships in the proportions of complete, simple, complex, compound, and elaborated sentences to those already reported for length of conversational unit.

Completeness and Complexity of Sentence Structure

As examples of age differences, 57.2 per cent of sentences were incomplete in a group of children aged 18 to 23 months, only 8.6

per cent in a group ranging from 54 to 60 months of age (Fisher, 1934). Simple sentences occurred in 9.6 per cent of the speech of children 18 months of age, in 17.3 per cent of that of children 24 months of age (McCarthy, 1930). The proportion of simple to complex, compound, and elaborate sentences ranged from 100 to 0 at 18 months of age to 5 to 1 at five years of age (Fisher, 1934).

Obviously in giving directions or writing stories for young chil-

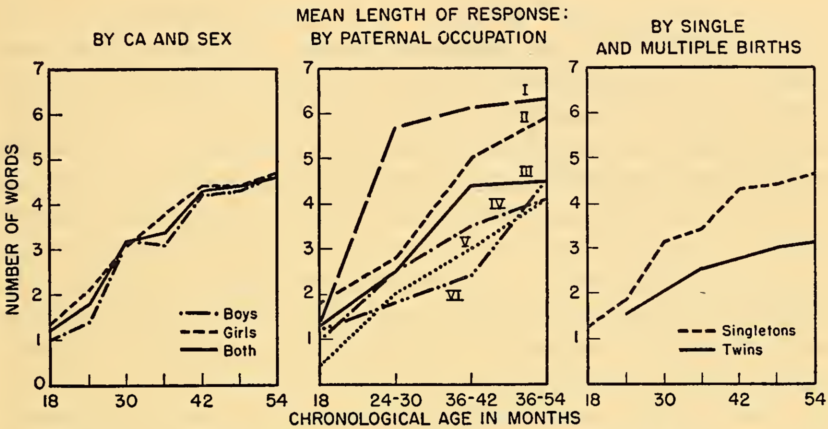

Figure 51. Mean length of response by chronological age, by sex, by paternal occupation, and by single and multiple births. From D. McCarthy, *The Language Development of the Preschool Child, Inst. Child Welfare Monogr.*, Ser. No. 4, 1930, University of Minnesota Press, and from E. J. Day, "The Development of Language in Twins," *Child Develpm.*, 1932, *3*, 179–199.

dren, syntax as well as vocabulary should be suited to the listeners' stage of development. At eighteen months, listener comprehension is apparently at an "all gone" level. Hence the advisability of using only essential nouns and verbs when communicating with young children. This not only facilitates understanding, it also offers a working model for the child to use in his communications.

The child's development of accepted grammatical usage, apparent in the structure of his sentences, is also revealed in his use of different parts of speech.

Parts of Speech

Though many studies have been made of young children's use of different parts of speech, they are not particularly helpful in defining developmental trends. This is because they have not always taken into consideration such facts as the following:

Grammatical classifications based on adult usage are meaningless when applied to children who use a word to convey the content of a sentence.

The setting in which a language sample is obtained affects the parts of speech used.

After a child is three years of age, the proportion of nouns, verbs, and pronouns in total words is controlled by the demands of sentence structure and so remains fairly constant.

A promising lead in arriving at developmental indices for use of parts of speech, therefore, appears to be analyses of types rather than estimates of percentage of such parts of speech as pronouns. In one such analysis (Goodenough, 1938) of children's remarks in free play, it was found that though the *percentage of* pronouns in total words showed little consistent change after children reached three years of age, there were differences in the *kinds of* pronouns used. For example, after three years of age there is less use of the third person neuter pronouns, *it* and *them*. As children learn the names of objects, these pronouns become less necessary. In another study (Jersild, 1938) a similar finding is reported in an analysis of the speech of nursery-school children in free play.

The various measures of language comprehension and expression that have been described raise the question of the extent to which they are all interrelated. There is also the question of whether a single verbal ability enters into and largely determines all acts of verbal comprehension and expression, or whether more than one factor is involved.

Interrelationships between Speech Characteristics

In an attempt to analyze and scale language achievement from birth to six years, one investigator (Williams, 1937a,b) undertook a partial inventory of language skills as set forth in grammar textbooks. His language achievement scale combined: (1) a shortened and modified form of an articulation test (Wellman, 1931), (2) a test for intelligibility or correctness of word usage, (3) a test of organization which included length of conversational unit and completeness and complexity of grammatical construction and (4) tests of understood and spoken vocabulary (Van Alstyne, 1929, Williams, 1937a).

When this scale was administered to a number of children there was fairly high agreement (majority of r's were .60 or over) between the various measures of expression, but low agreement between these and the vocabulary tests. (See Table 7.) This relationship between articulation and measures of verbal expression is supported by a report

(Davis, 1937) comparing 160 young children with good articulation with 88 having faulty articulation. Mean lengths of sentence for the two groups were respectively 4.85 and 4.00 words. Mean numbers of different words used were respectively 102.2 and 82.5. Faulty articulation, if prolonged, may therefore handicap a child both in his language development and in his social relationships.

In brief, on the basis of studies to date, at least two factors appear to contribute to verbal ability—verbal comprehension, and verbal expression. There is also evidence from studies of the form and content of young children's speech that developmental, environmental, hereditary, and personality factors play a part in a child's acquiring some command of the English language. There is, however, little indication of what speech as behavior means in his life. For this information we must draw on reports from England and Europe which present some contrast in method of study.

In the United States, as we have already seen, investigators have recorded and classified what children said in specific situations. The situations are described; the children are classified in terms of such differentiating characteristics as age, sex, mental test performance, parents' occupation, and type of home experience; and the results are expressed in terms of statistical frequencies, distributions, and relationships.

In contrast, in England and Europe stimulating analyses of the function of speech are offered by writers whose reports offer a wealth of interpretation, but whose observations are, for the most part, based on a population sample of one (and that one the son or daughter of the writer).

Though small and selected population samples and incidental rather than systematic methods of observation are not the means one associates with developing tenable generalizations on behavior, the reports mentioned offer no contradiction and considerable meaning to systematic investigations in the United States. Let us, therefore, consider what light they throw on the function of speech.

The Function of Speech in Early Childhood

Speech as an Expression of Emotion

The origin of the earliest speech sounds are traced by an English psychologist (Lewis, 1936) to the movements made before and after feeding. Pointing out that the organs of utterance are also

the organs of sucking, Lewis describes how phonation during sucking movements and while expelling air and swallowing after feeding produces the (early developing) gutteral back consonants *g*, *k*, and *l*, expressing comfort and contentment. Anticipatory sucking movements accompanied by nasal phonation also produce the (later developing) *m* and *n* front consonant sounds expressive of discomfort. The first speech sounds are thus not a chance selection. They may be explained in Darwinian terms of anticipatory behavior and differentiation of affective states.

A sound expressing satisfaction or pleasure in one situation may have its meaning extended to express similar satisfaction in another situation. Lewis reports a child's use of *fa* in smelling jonquils and again on seeing cherry blossoms, and another child's use of *si* for sea and later the same sound for a thunderstorm. The child's affective response to a situation is thus a factor in his development of meaningful utterance. An American psychologist (Shirley, 1933) similarly noted that infants use expressive tones and inflections before using recognizable words and that they respond discriminatively to friendly and scolding tones before they show understanding of words.

Intelligible words are also used by children, as by adults, to express and evoke feeling states. The little boy who looked around a living room full of bric a brac and sighed "Look at all the pretty no-no's" conveyed the frustration content of the situation, but not its objective reality. Similarly many political speeches express and evoke emotions but contain little objective factual content. Changes with age in the affective content of speech are therefore in the manner of its expression rather than in the frequency of its use.

Speech as Muscle Activity, as an Accompaniment and Substitute for Muscle Activity

The babbling of infants is viewed by some psychologists as *muscle activity* for its own sake with the same incentive as movement for its own sake—enjoyment of the process. Lewis, however, suggests that babbling may be interpreted as rudimentary art in that it reinstates and symbolizes past experiences of comfort and discomfort just as tragic verse for instance symbolizes human suffering.

Speech is also an *accompaniment of muscle activity*. The child's first cries are associated with bodily movement. His babbling likewise is a sound accompaniment to kicking and waving. At a later age spontaneous chanting accompanies many of his activities and in the nursery school all reports of young children's speech record that it

is largely concerned with current or immediately projected activity. Nowhere is this better described than by a Swiss psychologist (Piaget, 1926) who noted that young children in the Maison des Petits at Geneva spoke in what he termed collective monologue. Each child kept up a running commentary on his own activity, and, for the most part, neither evoked comment nor responded to the commentaries of his companions. An American psychologist (Fisher, 1934) also noted a relationship between nursery school children's speech and activity. She reports a rank order correlation (already referred to) of .86 between the average number of remarks per five-minute period and the average percentage of the five-minute period spent in use of materials.

Speech is also a *substitute for muscle activity*. The infant who makes his wants known by gestures progressively substitutes speech for physical action. In a comparison of social contacts of 16 three- and four-year-old children in a nursery school (Thomas, 1944, Sibley, 1945), the three-year-olds used more gestures and physical contacts, the four-year-olds made greater use of speech. In the same nursery school the teachers adapted their communications to the developmental level of the children by using more speech with the older children, more gestures and physical contacts with the younger children (Landreth, 1943).

Speech as a Source of Sensory Pleasure and a Means of Recalling Sensory Impressions

Young children are concerned with the sound, rhythm, and form of what is said as well as with its meaning. Their delight in repetition, reiteration, reduplication, and alliteration is perceptively recorded in a nursery school director's observations (Johnson, 1928) on children in her nursery school. Additionally, one has only to glance at the index of the *Oxford Dictionary of Nursery Rhymes* to be reminded afresh of the sound qualities that have lent enduring charm to such nursery classics as "Eeny meeny miney mo," "Hey diddle diddle," "Peter, Peter Pumkin Eater," "Hickory Dickory Dock," and "Humpty Dumpty," or to such quatrains as

Swan swam over the sea.
Swim swan swim,
Swan swam back again.
Well swum swan.

Whether *choo-choo*, *tick tock*, *bang bang*, *ding dong*, or *wow wow* are child- or adult-initiated, the universality of such reduplicates suggests that they are in accord with young children's speech habits.

Certainly most parents can furnish examples of their young children's invention of terms to recall sensory impressions. Words are used in the same way. A small boy riding in the back seat of a convertible with his hair streaming backward exclaimed with delight, "the wind is washing my hair," and set the driver thinking of Lavengro, "if I could feel the wind on the heath, I should wish to live forever."

Coupled with pleasure in vocal and verbal sound patterns is satisfaction in enumeration. Here again nursery classics and contemporary favorites conform to this satisfying literary tradition of early childhood with such successive enumerations as occur in "This is the house that Jack built," and "Who killed cock robin?"

The repetition so characteristic of early childhood suggests a factor in some of the stammering of this period. In an investigation involving children 24 to 62 months of age, (Davis, 1939, 1940), a fairly normal distribution was found in children's tendency to repeat syllables, words, and phrases. There was also a progressive decrease with age in all types of repetition. Similar evidence of a decrease with age in what an investigator (Loban, 1957) describes as word mazes, or repetitive statements from which the speaker has difficulty extricating himself, suggests that coercive attempts by adults to check this developmental tendency might result in its fixation and distortion in stammering.

Pleasure in the sound and rhythm of words is not limited to the early years of life, but in the years before speech becomes burdened with content and communication it is apparently more widely enjoyed for its sensory qualities. Hence, in choosing a book or story for young children, it is well to ask not only: "Are the words used in the child's vocabulary, and is the sentence structure short and simple?", but also: "Has attention been paid to the sound qualities as well as the meanings of words, or are there merely a sequence of insipid statements? Is there effective and satisfying use of enumeration, repetition, and reiteration, and is there the ongoing vigor of the present or the present progressive tense?" Consider by way of illustration, the simple satisfying directness of these cautionary lines for young diners.

> The vulture eats between his meals,
>   And that's the reason why
> He very, very rarely feels
>   As well as you and I.
> His eye is dull, his head is bald,
>   His neck is growing thinner.
> Oh! what a lesson for us all
>   To only eat at dinner!

It is a matter of common observation that infants tend to respond to vocalization with vocalization. From vocalizing in unison with adults, they proceed to imitation of adult sounds already in their own repertoire. Later they echo, after a pause, what the adult has said. At this stage the infant's speech becomes a means of identifying himself with a speaker.

Speech as a Means of Social Identification

The part social identification plays in communication and development of language is indicated in the report already mentioned of less vocalizing and fewer types of speech sounds made by infants under six months of age in an orphanage than by infants in their own homes. Obviously an orphanage child who infrequently has a speaking adult with whom to identify misses a major stimulus to the humanizing behavior of speech. Moving testimony to what this means in a young child's life is offered in the total vocabulary of two two-and-a-half-year-old twins who at the time of their adoption from an understaffed orphanage could only say: "Good morning children."

From imitation the child proceeds to interchange of meaningful speech. Sometimes, however, he simply thinks aloud. His audience serves as a social stimulus, but receives no other consideration. It is this collective monologue or "to whom it may concern" form of address that gives nursery-school conversation its distinctive mad-hatter-tea-party character.

Speech as Collective Monologue

Piaget (1926) observing this phenomenon in the speech of two six-year-old boys classified it as "egocentrism" and concluded that 45 per cent of the time the boys were unconcerned with the objective reality of what they said, or with putting themselves at the point of view of others and thus obtaining a response from them.

In thus distinguishing between speech *in the presence of* others and speech *addressed to* another, Piaget clarifies the study of social communication. He also makes it clear that any study of the function of speech must take into consideration *the speaker*, *the listener*, and *the situation*.

His definition of social speech in terms of the speaker putting himself at the point of view of the listener needs, however, further modification and study. For instance, his report that young children

were not very successful in reproducing for another child a story told them by adults hardly warrants a generalization that putting oneself at the point of view of others is dependent on age. Students in graduate seminars have similar difficulties. It is therefore clear that factors other than age contribute to clear exposition. Further, Rupert Brooke's lines on a young man's interrupted musings

> Safe in the magic of my woods
> I lay, and watched the dying light.
>
> * * * * * * * *
>
> You came and quacked beside me in the wood.
> You said, "The view from here is very good."
> You said, "How the days are drawing out."
> You said, "The sunset's pretty, isn't it?"
>
> By God! I wish—I wish that you were dead.

remind us that putting oneself at the point of view of another is a relative rather than an absolute achievement.

The proportion of "egocentrism" [2] in the speech of individuals of any age is thus obviously affected by the definition of egocentrism as well as by the circumstances under which the speech is obtained. This is illustrated in the contrasting percentages of egocentrism reported for two six-year-old boys at play—45 per cent (Piaget, 1926)—and for 120 children in a standard test situation in which a child talked to an adult—4 per cent (McCarthy, 1930).

In a different type of analysis another investigator (Fisher, 1934), stating that it is impossible to classify children's speech objectively on the basis of a speaker's social purpose, recorded instead the number of remarks nursery school children made about themselves compared with those they made about other people and things. Using a formula

$$\text{“egocentrism”} = \frac{\text{remarks about self}}{\text{remarks about other people and things}}$$

a coefficient of "egocentrism" was obtained of approximately .5, which compares closely with Piaget's figure.

A similar classification of adult speech (Henle, 1938) revealed a degree of egocentrism (40.7 per cent) much the same as that in young children. In this study overheard conversation of a large number of men and women university students was classified as ego-related if it referred to the speaker's activities, interests, feelings, emotions, ambitions, desires, opinions, attitudes, criticisms, and evaluations. Ap-

[2] The term "egocentrism" is a confusing one because it has been applied to speech which does not have a social purpose, *and* to a tendency to speak about oneself.

parently, therefore, differences in the "egocentrism" of adults and young children's speech are in terms of the manner of its expression rather than in its actual incidence.

Most speech has some informative content and it is a matter of common observation that this content in young children's speech increases as they grow older.

Speech as a Means of Interchange of Information and Ideas

Systematic study reveals both an increase in informative statements and questions with age (McCarthy, 1930) and a change in the type of questions asked. To illustrate, a preponderance of *what* and *where* questions are recorded for two-year-olds, a greater number of questions introduced without an interrogative for older children (Davis, 1932, 1937, Smith, 1933).

Environmental stimulation also plays a part in the development of language as a means of exchanging ideas. Children of parents engaged in professions were found to make more informative statements and ask more questions than children of unskilled workers (McCarthy, 1930). Factors contributing to this difference were, presumably, the inheritance of verbal ability and the imitation of verbal patterns characteristic of professional groups. Evidence that children's questioning is also stimulated by expectation of receiving adequate answers is offered in a study (Davis, 1932) which records that children asked more questions of adults than of children. The influence of cultural factors on children's questioning habits is likewise suggested in a greater number of causal questions (*how* and *why*) from boys, and more questions concerning social rules from girls.

This brings us to consideration of the part language plays in the development of concepts.

Speech as a Means of Organizing, Classifying, and Relating Impressions

Advancement in understanding in any field of knowledge is accompanied by the development of terms which make possible some systematic classification of impressions and some relating of them to the total experience of the persons concerned. Apparently many if not all young children go through a similar process in arriving at some understanding of their world: inventing a term which

sums up their impression of a situation and later extending the use of this term to other situations which have similar features.

Lewis (1936) in his lucid analysis of infant speech offers several examples of terms applied by a young child to several situations which are similar either in their objective form or in their functional or affective significance. Here are some examples from my own experience.

Objective form. Dada used for father and also for *any man; bow-wow* used for a *dog*, and also for a *rabbit*, a *cat*, and a *fur neckpiece.*
Functional significance. A two-year-old called her immediate family by their names but referred to all other persons as *gorms.* The neighbors who were most frequently in her house were named Gorman. Apparently it was not worth the effort to this child to discriminate between transients in the household. This same child referred to her bib as a *feeder* and also to the adult napkins and napkin rings as *feeders.*
Affective significance. She also referred to anything of a candy or nut nature as a "nice." General verbal concepts of this sort appeared to be perfectly satisfactory for several weeks in meeting this child's needs for classification of her experiences.

Though children may vary considerably in the extent to which they impose their verbal classifications on adults and the extent to which they accept, from the beginning, conventional adult classifications, there is no doubt that vocabulary is not imposed on a passive child. Arriving at meaningful verbal classification is a progressive process which is modified by the child's total life experiences, as well as by the social culture in which he lives.

A story may illustrate.

A group of three- and four-year-olds were taken to visit the stables of a college farm. While the children moved around inspecting and commenting on all that the stable offered in sights, smells, and sounds and the feel of leather, horsehair, hay, and hide, the elderly stableman rambled on in reminiscent and affectionate vein concerning the personal habits and past exploits of his charges. In this warm and friendly atmosphere of shared past experience, a four-year-old studied the stableman thoughtfully. As his teacher turned to go, he whispered, "Is he the horses' father?"

In summary, analyses of the function of speech in early childhood emphasize its value as a medium for thought, action, feeling, and social communication. They also suggest that maturity and en-

vironmental factors play a part in the child's development of this medium.

Let us now consider what this part may be.

Developmental and Environmental Factors Associated with the Development of Speech

Developmental Factors

Though developmental changes in the speech of young children are indicated in several studies, clearly defined sequences such as are reported in the development of locomotion have not been formulated. This is probably because longitudinal studies have yet to be made in which the same children's language development is systematically studied during the first five years of life. In the absence of this sort of observation, the summary below of some linguistic performances arranged in the order of their appearance suggests that these performances represent a developmental progression.

Development of Language
Preverbal stages

Expressive	*Receptive*
Sounds of comfort and discomfort.	Discriminatory response to human voice (infant ceases to cry at sound of voice).
Progressive increase in number of different sounds and in frequency of their use in babbling.	Responds to human voice by vocalizing.
Progressive increase in consonant-vowel ratio.	Distinguishes between friendly and unfriendly voice.
Use of expressive tones and inflections.	
Imitation of adult speech sounds already in infant's repertoire.	Understands some gestures. Understands some words.

Verbal Stages

Use of identifiable word to deal with a present situation.	Increase in number of words understood.
Use of identifiable word to refer to a past situation or absent object.	Increase in appreciation of shades of meaning.

Verbal stages (continued)

Expressive	*Receptive*
Combining words.	Continuing enjoyment of the sound and form as well as the meaning of words.
Increase in vocabulary and in loquacity.	
Increase in exactness of word usage, in number of words combined in a conversational unit, in completeness and complexity of sentences, and in comprehensibility of speech.	
Increase in accepted use of parts of speech and in proportion of informative statements and questions in speech.	

As the descriptive summary suggests, the child first uses a word or a sound as a generalized response to a total situation or to several similar situations. He also responds to the general intonation in which words are used before he learns to take into consideration the meaning of the words addressed to him under particular circumstances and in a particular situation.

Development of language thus involves processes of individuation and integration already noted in motor development. It also exhibits some universal characteristics which appear to be related to the total pattern of growth and development. For example, in all languages the time sequence in the acquisition of sound elements is the same (Jakobson, 1941). Further, as one investigator (McCarthy, 1952) points out, "the child does not use real language until after he has established satisfactory respiration, acquired front teeth, had some experience with solid food and assumed the erect posture."

Such a common developmental core offers an explanation of the similarities in stages of linguistic development in children of different countries.

These similarities in developmental stages are, as in motor development, accompanied by some variation in the rates and routes by which the stages are reached. Some children, for example, seem to accept adult terminology from the beginning, others impose verbal classifications of their own on their hearers for many months. Some who appear definitely retarded in language development at three years out-talk their companions at five. There are also indications that early language development may take place at the expense of other learning or be held in abeyance while other learning takes place. Figure 52, for instance, shows a decrease in young children's rate of acquiring new words during the period when they are learning to walk.

Though these variations in specific features occur, the similarities noted in general phases of development of speech, and their relationship to the total pattern of growth and development suggest that developmental factors within the organism largely determine the time of onset of these phases, and hence the efficacy of appropriate environmental stimulation.

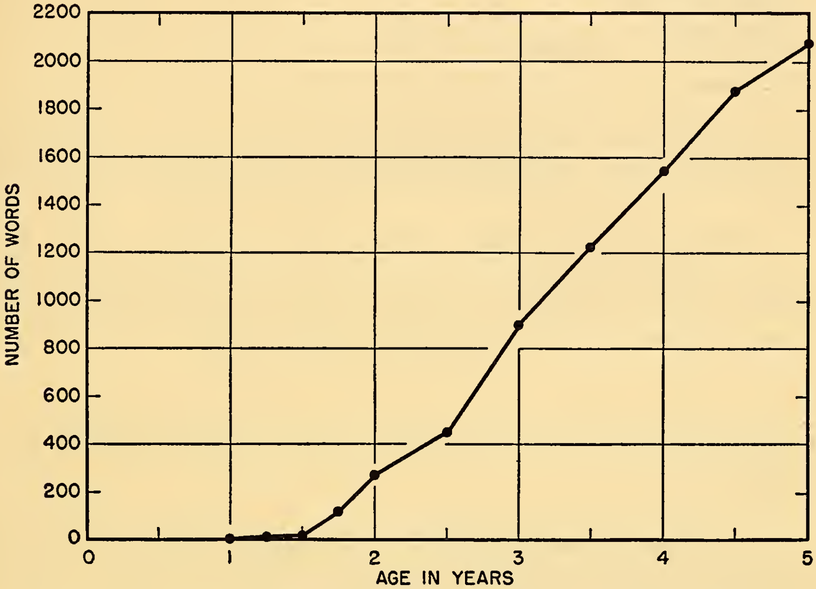

Figure 52. Increase in size of vocabulary in relation to age. From M. E. Smith, "An Investigation of the Development of the Sentence and the Extent of the Vocabulary in Young Children" Univ. Iowa *Stud. Child Welfare,* 1925, *3,* No. 5, University of Iowa Press.

However, what constitutes "appropriate stimulation" at successive stages of development has yet to be defined. The need for definition is apparent in an experimental study often cited as evidence of the importance of developmental factors in "vocabulary training." In this study (Strayer, 1930) one member, T, of a pair of identical twins was given intensive training at age 84 weeks in naming objects and carrying out simple directions. During this period the other twin C was given no opportunity to hear language. At age 88 weeks, twin C was given four weeks of identical training to that received by twin T. The results, summarized below (Table 8) suggest that twin C acquired words at a *slightly* faster rate during her deferred training period.

One still does not know, however, whether the type of "training" given T was the most effective one for her stage of development. Further, while twin T was undergoing training, twin C was using

TABLE 8

IDENTICAL TWINS' RESPONSES TO LANGUAGE TRAINING GIVEN AT DIFFERENT AGES AND FOR DIFFERENT LENGTHS OF TIME

	Twin T After 5 weeks training begun at 84 weeks of age	Twin C After 4 weeks training begun at 88 weeks of age
Words acquired	40	35
Response to directions	−	+ *
Pointing to pictures	−	+
Pronunciation	+	−
Use of two-word sequences	+	−

* + superior

gestures and being communicated with by gestures and sounds, both of which may have contributed indirectly to her acquisition of words later.

Though what constitutes appropriate stimulation at different stages of language development has not been experimentally determined, there is considerable evidence that the social environments of young children vary in the stimulation they offer.

Environmental Factors Associated with the Development of Speech

Environmental influences are reflected in differences in the form and content of children's speech in different situations and in the level of speech development in children whose environments offer different kinds and amounts of speech stimulation.

Influence of Specific Situation

Analyses of children's speech in the presence of adults and children reveal that they use more socialized speech and longer sentences with adults than with their age peers (Smith, 1935), that they ask more questions of adults (Davis, 1932) and make more use of the first personal singular pronoun in speaking to children their own age (Goodenough, 1938). Hence, it is reasonable to assume that conversation with adults stimulates a child's development of the speech forms in adult usage.

The activity a child is engaged in also affects the character of his speech. Outdoor play, indoor play, looking at pictures, and eating lunch have been found to produce different samples of conversation showing different lengths of response and different proportions of the various parts of speech (Young, 1941).

The content as well as the form of speech is influenced by the circumstances in which it occurs. Evidence that a situation arousing common concern leads to considerable common speech content is offered in an analysis of the speech content of a group of young children in a strange situation which included separation from parents and a medical examination (Shirley, 1938). Here one third of the concepts occurring frequently in the conversation of different children referred to mother, home, and family.

In the light of these reports any generalizations on young children's use of language should obviously be restricted to the type of situation in which the language sample was obtained. Generalizations should also be restricted to children who receive similar types and amounts of speech stimulation, which brings us now to evidence that the speech stimulation offered boys and girls differs in type.

Selective Speech Stimulation Offered Boys and Girls in Different Occupational Groups in Our Society

A slight sex difference in favor of girls is reported in almost all investigations of children's expressive linguistic abilities. There is evidence that girls speak earlier (Mead, 1913), speak more clearly (Wellman, 1931, McCarthy, 1930), have fewer speech defects (Johnson, 1948), and combine words more effectively than boys (McCarthy, 1930). In contrast to girls' slight superiority in fluency, there is some evidence that boys exceed girls in their understanding of words (Koch, 1954). How may these differences be explained?

A reasonable explanation is that sex differences are dependent on social environmental factors. Girls conform earlier to adult speech patterns because they identify more with the major speech-pattern source—their mother—and are given more encouragement to speak nicely or like ladies. Support for this explanation is offered in reports (Davis, 1937, Young, 1941) of sex differences being most marked in children of parents engaged in unskilled or semi-skilled manual labor and least in children of parents engaged in professions (Fisher, 1934). As we shall see later, sex roles tended to be more sharply contrasted in less skilled occupational groups during the period when these studies were made.

Similar support for a social environmental explanation of boys' slight superiority in understanding the meaning of words (Koch, 1954) comes from a report of a sex difference in the questions of young children (Davis, 1932): boys asked more questions concerning causal relationships, girls more questions concerning social relationships. Here one assumes that the kinds of questions asked by boys

and girls are affected by the selective response given these questions.

As boys' superiority in understanding the meaning of words has been found to be more marked when they are first-born rather than later-born children, let us now consider whether family factors other than a child's sex contribute to the speech stimulation he receives.

Selective Speech Stimulation Offered First-born and Later-born, Only Children, and Children with Siblings of Different Ages and Sex

In a study remarkable for its excellent research design (Koch, 1954), 360 five- and six-year-old first- and second-born children of two-child families were given the Thurstone Primary Mental Abilities Test which includes a vocabulary sub-test based largely on knowledge of word meaning. The children were so chosen that they constituted 24 subgroups, which made possible comparisons of performance on the basis of such variables as child's sex, birth order, sex of sib, and age spacing between the child and sib (3 age spacings represented 7–24 mos., 25–48 mos., 49–72 mos.). Comparisons were also made on the basis of combinations of these variables.

As a result it was found that though sex differences consistently favored the boys, they were statistically significant only when the boys were first-born children with a sibling two to four years younger. Further, though both boys and girls with a brother scored higher than those with a sister, the differences were statistically significant only when the brother was 2–4 years younger.

The explanation offered of these differences is that first-born boys are shown special devotion by their mothers (Sears, 1953).

If no other child is born within two to four years, this extended period of undivided maternal devotion stimulates development of word understanding. As for the superior stimulation offered by a brother rather than a sister, here the explanation is that boys are more stimulated and stimulating than girls as a result of their higher activity level and the freedom accorded their exploratory behavior. The additional social stimulus given a first-born son by the arrival of a younger brother is presumably best explained in terms of the cherished American belief that competition leads to expanded enterprise.

In Koch's study, brothers exerted less stimulating influence on development of word comprehension when they were close in age. The lack of stimulation resulting from this circumstance is further apparent in comparisons of development of adult speech patterns in singletons, twins and siblings. Twins have been found to be behind singletons (Day, 1932) and triplets behind twins (Howard, 1934) on

such measures of expressive linguistic ability as comprehensibility of speech and length of conversational unit. Members of multiple births apparently suffer two handicaps in speech development: they must share the attention of their major speech-pattern source, and they spend the major portion of their time with an associate who is no more skilled than themselves.

The relationships so far established by no means exhaust the possible intra-family factors that contribute to speech stimulation. They merely suggest that any circumstances which affect a young child's relationship with his major speech-pattern source or which stimulate his development of verbal concepts will contribute to his speech development.

As parents are a young child's major speech-pattern source and as they largely determine the kind of stimulation he receives in understanding the meaning of words, it is reasonable to suppose that there is some relationship between children's and their parents' speech characteristics. Evidence of such a relationship is offered in comparisons of language development in children from families of different occupational groups.

Speech Stimulation Offered by Parents with Different Occupational and Educational Experience

In all comparisons children of parents in professional groups are superior in their rate of acquiring the sounds characteristic of adult speech, in the extent of their vocabularies, in the length, completeness, and complexity of sentences they use, and in the number of informative statements they make and questions they ask. For example, in a comparison (Young, 1941) of six hours language records obtained on 37 children in a university nursery school and 37 in a relief nursery, the university group surpassed the relief group in all aspects of language studied. Similarly in a study of articulation (Davis, 1937), 73 per cent of children from upper socioeconomic levels were rated as having perfect articulation at five and a half years compared with 58 per cent of children from lower socioeconomic levels.

Relationships have also been found between the numbers of words children understand and the social characteristics of their home environments. Correlations between understood vocabulary scores of three-year-olds and measures of their parents' education, occupation, vocabulary, and ratings of home furnishings are (as the summary of relationships in Table 9 shows) of the order of .6 (Van Alstyne, 1929).

One explanation of the differences summarized in Figure 51 is

TABLE 9

CORRELATIONS BETWEEN VOCABULARIES OF THREE-YEAR-OLD CHILDREN AND MEASURES OF THEIR PARENTS' EDUCATION, OCCUPATION, AND VOCABULARY

(*From Van Alstyne, D. 1929*)

Mother's education	.65 ± .05
Father's education	.58 ± .04
Mother's vocabulary	.57 ± .05
Home rating scale	.67 ± .05
Number of books in child's library	.60 ± .05
Occupation of fathers	.55 ± .05

that homes in which parents' occupations require a high standard of verbal facility provide more speech stimulation and a better adult speech pattern than those in which parents' occupations demand and reward physical exertion. While it is possible that hereditary factors also play some part in these differences, further evidence of relationships of speech development with bilingualism and with institutional life suggest that environmental factors may play the major part.

Circumstances sometimes require that a young child learn two languages simultaneously. Arguments sometimes advanced for such an undertaking are that the child will speak both languages "without an accent" and will learn both without phonetic drill. Are these assumptions sound?

Bilingual Speech Stimulation

I recall a four-year-old son of a French professor who spent summers in France, winters in the United States' Midwest. This boy spoke and heard only French at home, and only English in the nursery school. He had the added distinction of having bitten his way out of three neighborhoods, and of holding an all-time record for biting in the nursery school. His teacher observed that in moments of impatience with his companions, the boy would open his mouth as though to speak and instead would sink his teeth in the offending companion. Discussing with his mother the purpose of the bilingualism, the teacher learned that though it was to maintain a *pure* French accent, the boy's French was the despair of his Gallic relatives. Briefly, in this boy's case, the outcome of bilingualism was that he bit the French in summer and the Americans in winter while speaking, between snaps, with an indifferent accent on both sides of the Atlantic.

What of studies on larger numbers of children? A comparison was made of the performance on a spoken vocabulary test of bilingual Chinese children (aged 37–77 months) of superior socioeconomic

status in Hawaii and monolingual children in the United States (Smith, 1949). It was found that in either language the bilingual group were below the average of monolinguals of the same age. When the bilinguals' vocabularies in Chinese and English were added together, two fifths of the children exceeded the norms for monolinguals, but when words of duplicate meaning were subtracted only one sixth of them did.

The investigator suggests on the basis of this evidence that only the superior bilingual child is capable of attaining the vocabulary norms of monolinguals. She further adds that a single name for each of a larger number of concepts contributes more to a young child's understanding and ability to communicate than two names for each of a smaller number of concepts.

While it is clear that young children whose parents speak a different language from that spoken in their nursery school or kindergarten have no choice in the matter of coping with two languages, it is equally clear that their bilingualism should be taken into consideration in evaluating their mental test performance and in developing pre-reading experiences for them. Thoughtful consideration should also be given to the social distinctions which may be formed in a child's mind when his school and home teaching is imparted in different tongues and when the language he learns to read is not his mother tongue. Viewed from this standpoint, the social circumstances associated with bilingualism are probably more significant factors in a child's intellectual and social development than the fact that he is learning two names for each concept.

Another type of social circumstance that affects the speech stimulation some young children receive is their commitment to an institution.

Speech Stimulation Offered in Institutional as Compared with Family Life

Evidence already offered (Brodbeck, 1946) shows that infants in an orphanage vocalized less frequently and made fewer types of sounds during the first six months of life than infants living with their families. Apparently institutions in which attendants do not have time to respond to infant vocalizing or to provide a specific loving adult with whom the infant can identify offer very little stimulus to vocalizing. They also offer little stimulus to the use and understanding of words. In a comparison (Williams, 1937b) of spoken vocabulary test scores of children in a university nursery school (221 children, 27–74 months, mean IQ 120) and in an orphanage (55 children, 28–73

months, mean IQ 84), the differences were all in favor of the children in the university nursery school. Further there were indications that the differences were dependent on environmental stimulation. For example, correlations between age and vocabulary scores, with mental age held constant (Table 10), showed that age had little effect on

TABLE 10

PARTIAL CORRELATIONS BETWEEN VOCABULARY AND MENTAL AGE, AND VOCABULARY AND CHRONOLOGICAL AGE, IN A UNIVERSITY NURSERY SCHOOL AND AN ORPHANAGE GROUP OF CHILDREN

(From Williams 1937b)

Partial Correlation	*University Nursery School* *N = 221*	*Orphanage* *N = 55*
C.A. and vocabulary (M.A. constant)	.49	.13
M.A. and vocabulary (C.A. constant)	.43	.65

vocabulary in the orphanage (r = .13) but that it operated about equally with mental maturity in home and nursery school environments which offered considerable language stimulation (rs = .49, .43).

Confirming evidence of the influence of a stimulating environ-

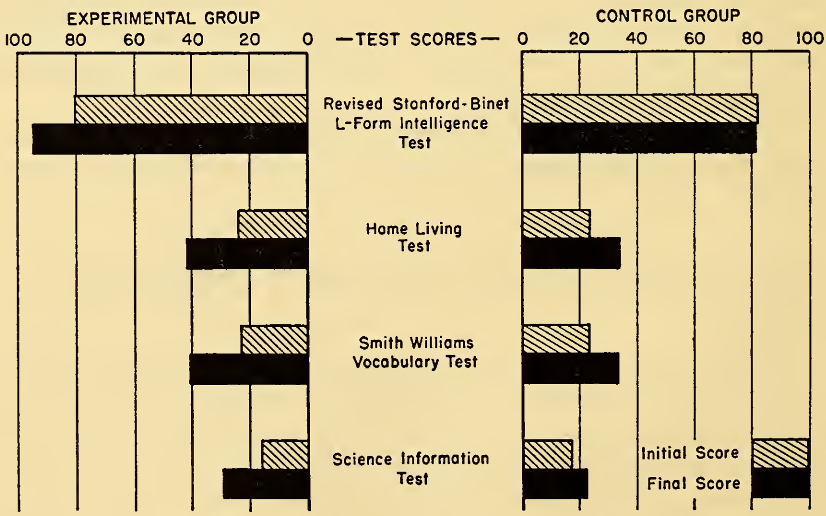

Figure 53. Effects on vocabulary, fund of information, and intelligence test score of enriching an intellectually impoverished environment. From H. C. Dawe, "A Study of the Effect of an Educational Program upon Language Development and Related Mental Functions in Young Children," *J. Exp. Educ.*, 1942, *2*, 200–209.

ment on language development is offered in a study (Dawe, 1942) in which 22 orphanage children were divided into an experimental and a control group on the basis of school group, age, sex, mental age, IQ, and scores in a spoken vocabulary test and a "home living and general science" section of an information test. The experimental group were then given a training program designed to promote real comprehension of words and concepts; they looked at and discussed pictures, they listened to poems and stories, and they went on short excursions. Following this training period, both the experimental and the control group were retested. The results shown in Figure 53 indicate that enriching an intellectually impoverished environment leads to improvement in vocabulary, in general fund of information, and in mental test scores.

In the light of this evidence we might well ask whether it is possible to formulate specific procedures that are likely to stimulate speech development in early childhood. The formulation which follows is such an attempt. It must be considered tentative because the effectiveness of specific types of speech stimulation has not been experimentally determined.

Types of Speech Stimulation Likely to Prove Effective at Different Stages of Development

"Baby Talk"

The fostering of speech begins in the cradle with the encouraging affectionate sounds and gestures made by a mother as she bends over her baby, feeding and bathing him and making him comfortable. With his eyes on her face he hears the sounds she makes and sees the movements that accompany them. Speech thus becomes recognized as a means of identification and communication, an accompaniment of comforting care.

Rewarding Response to Speech Efforts

As an infant begins to speak words his first attempts at conversation, lacking in form and content though they may be, deserve and are encouraged by acknowledgement, such as a nod, a smile, or a responsive "oh." No child can be expected to learn that speech should be listened to and a speaker should be given a chance to finish his remark if he is not accorded this courtesy himself. Further, no child can progress from the disjointed statements of early childhood to the

comparatively fluid characteristics of adult speech without considerable practice.

Good Speech Patterns

Children learn language in part by imitation. Therefore the pattern is important. In an Eastern nursery school a three-year-old daughter of busy parents, each engaged in a profession, spent most of her time with a Czech maid newly arrived in this country. As a result child and maid both spoke in halting English with a marked accent, and appeared to be the only people who understood each other. Similarly the children of an American mining engineer in North Africa adopted the dialect of the native servants with whom they spent most of their time and began referring to their father in dialect as "white man."

Speech Substituted for Action

In the early stages of language development a child combines only the essential nouns and verbs. In giving directions or suggestions, adults can thus insure understanding and give a child a working pattern for making his wants known by adapting their communications to the child's level of syntax. Adults can also encourage children to substitute words for blows or brawls by suggesting to a child who is tugging at another's property or just screaming: "Tell him what you want. Maybe he will give it to you."

Experiences Which Make Words Meaningful

Knowing a word is a matter of experience. The development of vocabulary calls for first-hand experiences which give meaning to words heard and used. During World War II a nursery school boy whose mother worked in the shipyards was approached by two nursery school "tigers" clawing the air and giving occasional shrill growls. Undaunted, the boy stood his ground. "I'm an assembly lion," he said and gave a threatening roar. One wonders what picture this boy had of his mother's activities during the time she spent away from him in her tin hat, overalls, and heavy gloves.

Use of Exact Terminology

Adults can also help children by being exact in their use of words. In referring to a tricycle a child is riding on in the nursery

school, "your turn on the tricycle" establishes the temporary nature of ownership whereas a careless referral to "your tricycle" may lead to a property problem. "Good" and "bad," if used at all, should clearly qualify a specific circumstance or action so that a child can recognize them as the personal judgments they are. To illustrate the confusion their use may cause, some years ago a nursery school teacher in looking at the children's throats as they entered the nursery school in the morning fell into the habit of saying a smiling "good" as she patted each child on the back after looking in his open mouth. This rite apparently impressed the young children as a therapeutic procedure as about this time a two-year-old's father developed a serious throat infection. Without the antibiotics of today the family doctor, a consultant and the little boy's mother became more grave each time father's throat was looked at. Seeing this unsatisfactory state of affairs in which looking at a throat was only leading to head shaking and anxiety, the little boy said "If Miss L. were to look at him, he would say 'ah'—and she would say 'good.' "

Acceptable Outlet for Play with Words

In language as in motor development, young children's play reflects the urge to exercise developing skills. Young children therefore love to play with words and sounds, enjoying their rhythm and their sonorous qualities. Giving this play an outlet in stories, verse, and songs helps to set time and place limits for an activity that can be trying for adults already frayed by the jingles of radio and television commercials.

Speech like motor activity is only one aspect of behavior. How is it related to other forms of behavior?

Relationships Between Speech Development and Other Aspects of Behavior

The only interrelationships that have received much systematic study are those between language development and intelligence test performance.

Language Development in Relation to Intelligence Test Performance

At all ages at which understanding and use of words play a large part in intelligence tests (two years and over), positive

correlations of the order of .6 or higher are reported between test performance and measures of understood and spoken vocabulary. For example, in a study (Van Alstyne, 1929) involving three-year-olds, the correlation between understood vocabulary and Kuhlman Binet score was approximately unity. In another study (Ammons, 1948), correlations between children's performance on a spoken vocabulary test (Full Range Picture Vocabulary Test) and the Stanford Binet was slightly above .8. A reasonable explanation of these relationships is that both the Kuhlman Binet and the Stanford Binet Intelligence Tests are in great part tests of language comprehension; hence a standardized vocabulary test offers a partial substitute for them at the three- and four-year level. This parallel relationship between language and mental test performance is also evident in a study already referred to, in which a group of orphanage children received an educationally stimulating program in understanding words and concepts, in thinking critically and noticing relationships. Figure 53, which shows the test scores before and after the training period for this experimental group and a control group, makes it clear that both vocabulary and mental test performance were improved as a result of this kind of environmental stimulation.

A child's ability to combine as well as use and understand words is also related to mental test performance. Length of conversational unit shows increases with increasing mental age that parallel or exceed those found for chronological age (McCarthy, 1930). Further, a group of children with superior mental test performance (mean IQ 133) were found to average longer conversational units than a group with average performance (mean IQ 109).

Other evidence of a relationship between mental test performance and language development is found in the early average age of talking (11 months) reported for a group of gifted children (Terman, 1925) and the later average age (38.5 months) reported for a feebleminded group (Mead, 1913). These figures do not of course indicate that all children who talk late are necessarily retarded in mental development. Some children don't talk because their needs are anticipated without any verbal effort on their part.

At the preverbal level, there are likewise indications that retarded development of the sounds characteristic of adult speech is associated with retarded mental test performance. An analysis (Irwin, 1942) of the speech sounds of 10 low-grade feeble-minded four-year-olds revealed that they approximated those of infants one year of age in types of vowels and vowel-consonant ratio.

Such relationships suggest that a child's use and understanding of

language may play some part in his ability to learn and profit from experience.

Relationships Between Language Development and Learning

Two studies, already reported, suggest the way in which comprehension and use of language contribute to learning. In one (Pyles, 1932), children learned faster which of 5 paper mounds a toy was hidden under when the mounds were given names. It required an average of 16.5 trials to locate a toy when mounds were unnamed, 7.5 trials when they were given nonsense names, and only 4 trials when the mounds had the shape and were given the names of familiar animals.

Here naming objects helped children to discriminate between them. Similar evidence of the effect of having words for what is learned is offered in experiments in which learning scores of children who were given only a demonstration of a ring toss performance were compared with those who are given both the demonstration and verbal directions (Goodenough, 1929). The results for the groups were as follows:

Group given demonstration and encouragement	—36% improvement in score
Group given demonstration and verbal directions	—66% improvement in score

Children therefore learn better when words are used to direct their attention to what they are learning. Short slogans, such as, "cross with grownups," "look both ways," "soft voices indoors," help a young child in learning to conform to the mores of the household and community. There will be time later for him to learn that slogans from advertisers or politicians call for closer scrutiny.

Relationships Between Motor and Language Development

Although less susceptible to measurement, these relations do exist, as is evident from the following facts already mentioned: the first speech sounds are an accompaniment of mass activity, gestures precede language in communication, supplementary gestures decrease as language increases, rhythmic vocalization accompanies physical ac-

tivity, and a large part of the speech of young children is concerned with their activity. Additional facts are that speech development is held in abeyance when a young child is learning to walk; and in somewhat similar vein, boys, who are more proficient in gross motor skills than girls, are less proficient in language. Finally, stammering is associated with inconsistency in handedness.

The mechanism involved in these relationships is not clear. In partial explanation there appears to be some complementary interactions and some common developmental determinants.

Relationships Between Language and Emotional Development

These relations are inferred rather than clearly demonstrated. Case reports of delayed speech, interrupted speech, as well as reversion to infant speech, and onset of stuttering associated with some disturbing circumstances in a child's life suggest the need for exploring the emotional significance of different types of speech behavior in early childhood.

Some of the ways in which speech content reveals emotional needs are indicated in a study of the language development of eight totally blind children (Maxfield, 1936). The blind children asked many more questions, and used a much higher percentage of proper names and of emotionally toned responses than sighted children in a similar test situation.

Interrelationships Between Language and Social Development

These relations, though also not directly investigated, are readily apparent. The infant or young child imitates and echoes adult sounds as a means of social identification. Later, his ability to verbally agree or disagree with an interrogator establishes the uniqueness of his individuality. Language development thus underlies and parallels social development. In specific illustration, the widely publicized negative phase of early childhood occurs at an age when vocabulary and language arts are inadequate for a gracious refusal. Similarly, there is less social interaction and shorter periods of social contact in young children who have little language facility than in older children. There are also more physical contacts and conflicts

centering around young boys than around young girls, in part due to the fact that boys have less command of language than girls.

Though these interrelationships are apparent, their dynamics are less obvious. While it is reasonable to assume that some command of language facilitates social behavior, further study is needed to determine the ways in which they are interdependent.

In summary, language development is part of a child's total development. Levels of performance in different kinds of behavior—motor, linguistic, social, etc.—therefore reflect the influence of common developmental factors, of reciprocal stimulation, and occasionally of expanded performance in one kind of behavior at the expense of that in another.

Review

In early childhood speech develops by identifiable stages which could be more meaningfully related if longitudinal studies were available of the development of language, similar to those of motor development. At the preverbal level, development is reflected in progressive increases in the frequency of vocalization and in the types and proportions of adult speech sounds made by the infant. At the verbal level, there are progressive increases in comprehensibility of speech, in size of vocabulary, in interchange of information, in length of conversational unit, in completeness and complexity of sentence structure, and in adult usage of parts of speech.

The form and content of young children's speech is related to the situation in which the speech occurs and to the persons—children or adults—to whom the speech is addressed.

Its complexity of functions is reflected in its use as a medium for thought, action, feeling, and social communication.

In terms of group averages, the rate of langugae development is faster in children with high mental test scores than in those with low scores, in children of parents engaged in professions than in those whose parents are unskilled workers, in children in homes than in children in institutions, and in children who associate for the most part with adults rather than their age peers. Slight but consistent differences in favor of girls are reported for such measures of language expression as comprehensibility and length of conversational unit, differences in favor of boys in understanding the meaning of words. Bilingual children as a group develop names for a smaller number of concepts than monolinguals.

An analysis of correlations between different measures of language development, similar to the analysis, explained on page 107, of correlations between different measures of motor skills, suggests that two factors or abilities are involved—one, comprehension; the other, expression.

Relationships between linguistic and other behavior of young children are, with the exception of mental test performances, expressed in descriptive terms and inferential generalizations, suggesting the need for further definitive research.

Recommended Reading

The following are condensed reports in *Readings in Child Psychology*, edited by Wayne Dennis (New York: Prentice-Hall, 1951): pp. 250–60, Lewis, M. M., "The expressive nature of early vocalizations" (A phonetic analysis of infants' vocalizations, and their relationship to states of comfort and discomfort.); pp. 269–78, Lewis, M. M., "The expansion of meaning" (An exploration of the ways in which sounds used in one situation may be extended to other situations.); pp. 261–7, Allport, F. H., "The conditioned response as a basis for language" (An explanation of the way in which early sounds become associated with sounds produced by adults and how they become associated with objects.); pp. 315–19, Piaget, J., "Communication between children" (A description of a test of young children's accuracy in reproducing stories told to them.).

See also the following reports in *Psychological Studies of Human Development*, edited by Raymond G. Kuhlen and George G. Thompson (Appleton-Century-Crofts, 1952): pp. 230–6, Davis, D. M., "Speech patterns of young children" (An analysis of the repetitions found in the speech of 62 young children.); pp. 239–44, Dawe, H. C., "Environmental influences on language growth" (A brief report of the results of experimentally enriching the language experience of a group of young children in an orphanage.).

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Chapter 6

EMOTIONAL BEHAVIOR

How can we account for the emergence of specific identifiable patterns of emotional behavior that are not present at birth?

What is the function of crying in early childhood?

What are common fears of young children?

What can parents do to reduce the fear-producing content of strange or painful experiences?

Is there any evidence of generalized anxiety in young children?

What changes occur with age in the sources and expression of anger in young children?

Do young children harbor hostility and resentment?

What family circumstances are conducive to jealousy?

Do young children's responses to frustration differ from those of adults?

What are the bases of emotional well-being in early childhood?

We know less about the emotional development of the young child than we do about his motor or language development. This is not due to lack of interest. It is generally accepted that

practically all behavior is influenced and accompanied by feelings of some sort. In motor behavior, for instance, we have already seen that children, flushed with success, tended to throw too far following a ringer in a quoit-tossing game (Goodenough, 1929), and that children's speed of movement was related to their emotional characteristics (Pomeroy, 1938): extroverted children, for example, were speedier than introverted ones.

In language too, we have evidence from Lewis (1936) that some words are developed on the basis of their affective significance for the child, and from Shirley (1938) that a common feared experience produces considerable common content in the speech of young children. Children's recall of experiences is also related to their emotional state. In a study involving children undergoing play therapy, it was found that children's recall of well-known stories was related to their progress in therapy (Despert, 1938): as therapy advanced, stories were recalled as being more pleasant and having more cheerful endings than they were when children were in the emotionally disturbed early stages of therapy. In perception likewise we shall see that selection and interpretation of sensory cues reveal children's need for constancy and familiarity in their environment (Hildreth, 1941), and that their judgment of size of objects is related to the rewards associated with the objects (Lambert, 1953). In mental test performance too, we will find that performance may be affected both by emotional factors in the test situation such as its strangeness (Updegraff, 1932, Rust, 1931) and by the emotional climate of the child's life (Despert, 1946, Honzik, 1948). As for learning, evidence of the part played by emotion is even more striking. A child learns a conditioned fear-response to a situation as the result of only one experience when this experience is accompanied by strong emotion (Landreth, 1942).

Despite such evidence of the pervasive character of emotion, it remains difficult to study, partly because it is manifested in different ways: in overt behavior, in physiological reactions, and in subjective feelings. The major difficulty is, however, that we cannot explain emotions without implying the existence of motivations of some sort, and at present we do not have adequate evidence for a scientifically acceptable theory of human motivations and behavior mechanisms. In place of such a theory of behavior we have, as will be discussed later, a host of theories offering partial and often unverifiable explanations of some aspects of behavior.

It is not surprising then that the majority of systematic studies of emotional behavior in young children have been of a surface episodic type, concerned with noting the overt responses of children

of different ages to such stimuli as a snake, a large dog, or a loud sound (Holmes, 1935), or recording the circumstances under which they cry or laugh or show anger or fear.

A problem of this sort which early engaged the attention of investigators was the nature of emotional behavior in newborn infants.

Emotional Behavior of Newborn Infants

Do INFANTS exhibit identifiable emotions during their first days of life? This question has already been answered in Chapter III. Watson's (1919) hypothesis of three stimulus-response patterns identifiable as fear, rage, and love proved untenable when it was found that independent observers could not identify these emotions in newborn babies regardless of whether they saw both the stimulus and the infants' response or only the response to unspecified stimuli (Sherman, 1927).

Overt Stimulus-Response Patterns

If specific stimulus-response patterns cannot be identified, what can be said of emotional behavior at birth? Little more than that resisting or rejecting stimuli by kicking, crying and thrashing movements would seem reasonably attributable to "dissatisfaction" or distress, while a turning toward or accepting stimuli with relaxed passivity might equally reasonably be attributed to "satisfaction." As for the stimuli which elicit these generalized response patterns, the "distress" or dissatisfaction response appears to be associated with visceral tension, with pain, and with sudden intense stimuli, all of which presumably upset the infant's state of equilibrium or homeostasis. The "satisfaction" response is associated with relief of tension and with such feeding, wrapping, and handling as restore and enhance equilibrium. In addition to these two discernible stimulus-response patterns, there is also an initial startle response to sudden intense stimuli. This has already been described as the Moro reflex.

From these generalized and primitive response patterns, later specific and complex patterns of response are differentiated and elaborated. A schema (Bridges, 1930) of the sequence in development of these complex patterns, based on a psychologist's observation of infants in a foundling hospital and of children in a nursery school, is presented in Figure 54.

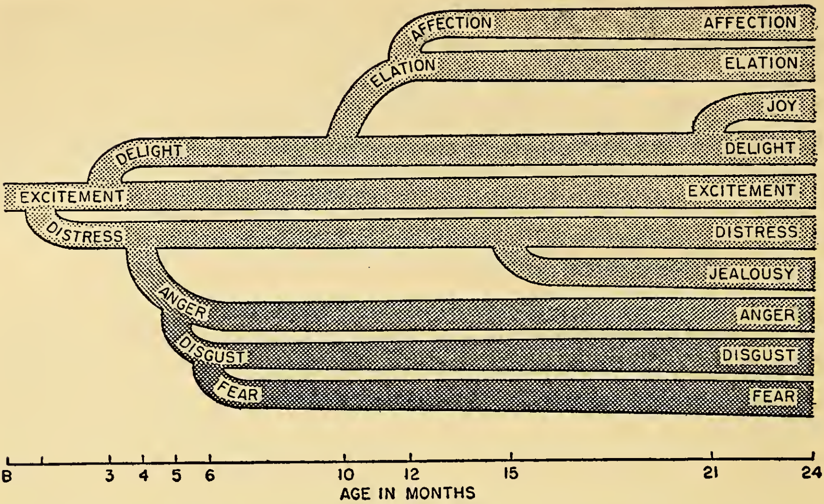

Figure 54. The differentiation of specific emotional patterns from a general condition of excitement during the first two years of life. (After Bridges.) From D. Krech and R. S. Crutchfield, *Elements of Psychology.* Copyright 1958 by David Krech and Richard S. Crutchfield. New York: Alfred A. Knopf, Inc.

In addition to responding overtly the newborn infant also reacts physiologically to disturbing stimuli.

Physiological Responses

Investigations of sensory acuity of newborn infants (Pratt, 1930) reveal pulse and respiratory responses to sudden intense stimuli. As these are stimuli which produce identifiable fear responses at later ages, physiological response to them in the first days of life may be considered evidence of physiological responses to emotion-producing stimuli. Other types of physiological response such as the psychogalvanic response, evidenced by changes in resistance to the flow of electric current through the skin, have so far not been demonstrated. This may be because the free overt discharges of tension in infancy are less likely to be accompanied by physiological reactions than are the inhibited responses of adulthood.

Subjective Feelings

What the infant feels is a matter of conjecture. As the cortex or higher brain is immature at birth, it seems unlikely that the neonate can think about his feelings. His overt behavioral response is a manifestation of lower not higher brain functioning. Whether

such experience of lower brain origin can leave traces which become a part of conscious or unconscious memory at present seems doubtful. What seems more likely is that the infant's subjective feeling states are as undifferentiated and fuzzy as his overt behavior.

If specific patterns of emotional behavior are not present in identifiable form at birth, how do we account for their appearance at a later age? In one experiment, for example, (Goodenough, 1931b), 68 university students were able to match photographs of a ten-months-old infant portraying emotion with descriptions of the situations in which the photographs were taken with an accuracy almost six times better than chance. In another investigation (Jones, 1935) in which children's overt and psychogalvanic responses to disturbing situations were compared, there was evidence that different children had developed different patterns of response. Some tended to externalize their emotions in overt behavior, others to internalize them in physiological responses.

Explanations of the Emergence of Specific Identifiable Patterns of Emotional Behavior

There are three possible explanations of this emergence of patterns of behavior not present at birth. One is that maturation is responsible for their delayed appearance (this is the explanation offered by Goodenough), another is that the patterns are learned, and the third is that both maturation and learning are involved. Though the third explanation would seem the most plausible when applied to the total range of emotional behavior occurring during the total span of childhood, there is some evidence that maturation alone may account for some of the simple stimulus-response patterns of behavior.

For example, a narrative description and cinematographic record of the overt behavior of a blind, deaf ten-year-old child (Goodenough, 1932) reveals patterns of response practically identical with those of sighted children and very similar to the classic descriptions of Darwin and Spencer. Similar results are reported in another study (Thompson, 1941) of 26 blind and 29 seeing children, aged 7 weeks to 13 years. In this study, however, the investigator does note effects of mimicry appearing in some stylized expressions exhibited by the older seeing children. In yet another study, motion pictures of 118 seeing and 50 blind children (Fulcher, 1942) taken while they were voluntarily expressing happiness, sadness, anger, or fear show similar

types of differentiation of response in the blind and the sighted, but a *sharper differentiation* in the case of the seeing children.

In the studies just reported, there is evidence that *maturation plays a part in the overt expression of emotion.* In other studies, there is evidence that the *emotional content of situations for particular children is also dependent on maturational factors.* Thus in a study (Bayley, 1932) in which a group of infants underwent a monthly testing and measurement program, their crying during the second six months of this study appeared to be in response to the strangeness of equipment, testers, and procedures. This, however, had not caused crying during the first six months.

All of the foregoing evidence indicates that maturation plays an important part in development of emotional behavior. It indicates too the need for caution in attributing adult nuances of feeling to infants and young children. Maturation alone, however, cannot explain the development of individual patterns of emotional behavior in complex social situations. Nor can it explain why some children tend to internalize, others to externalize their emotions. Here it would seem that individual differences in physiological reactivity or in early experiences must be the main factors.

For example, as evidence has already been offered of some learning in the first days of life, it is reasonable to suppose that crying and kicking, when regularly rewarded by attention, tend to become "stamped in" or reinforced as a motor discharge pattern of response to tension. It also seems reasonable to hypothesize that lack of attention to crying and kicking may lead to other means of responding to tension, *perhaps* by physiological reactions which may be less desirable for the infant's well-being and future functioning.

But, before speculating further, let us review what is currently known concerning specific patterns of identifiable emotional behavior in early childhood. Among such patterns the earliest to appear and easiest to identify is crying.

Characteristics of Specific Identifiable Patterns of Emotional Behavior

Crying

Developmental and Individual Differences

The newborn infant literally announces his presence with a cry. What the function of this cry is—aid or accompaniment to respira-

tion, response to stimulation of the skin or protest at being born, as Rank (1929) suggests—is not clear. Whatever its function, crying increases in the first days of life (Irwin, 1930). After infancy, though young children are still ready criers, there is some evidence from nursery school studies (Brackett, 1934) of a decrease with age in frequency of crying. Presumably this results from children's development of a more acceptable and effective means of relieving disturbing circumstances.

There are not only age differences in frequency of crying, there are also individual variations. In a study already mentioned in Chapter III of crying of newborn babies in a hospital nursery (Aldrich, 1945), one baby spent 243 minutes a day crying while another cried only 48 minutes. The average of the group was 117 minutes. Differences such as these would seem most logically accounted for on the basis of constitutional differences. We have, for example, already learned that some infants are more active and reactive at birth (Pratt, 1930, Balint, 1948a,b). Also some adjust more satisfactorily to the feeding situation. Aldrich noted that the babies who spent the most time crying were those with feeding difficulties. This raises the question of the circumstances under which infants and young children cry.

Circumstances in Which Crying Occurs

Evidence has already been offered of a relationship between crying and *hunger* (Marquis, 1941, Aldrich, 1945, 1946). There was, for example, more crying and activity in infants on a four-hour schedule than those on a three-hour one, and still more crying in infants who were abruptly switched to a four-hour schedule after having spent 9 days on a three-hour one.

Evidence has also been offered of a relationship between crying and close wrapping during the infants' first days of life. There was less crying in clothed than *unclothed* infants (Irwin, 1934), and the use of a cotton wrapping blanket for each infant helped to reduce crying in a hospital nursery (Aldrich, 1946). Presumably close wrapping duplicates in some way an earlier familiar state of prenatal life. It is possible that for this reason some infants reared on a cradle board are reported to cry to be put back when they are removed from it for longer than the customary interval (Dennis, 1940a).

Popular belief that there is more crying when a child is *tired or sick* or not himself is borne out in two studies. In one (Bayley, 1932), a record of infants' crying during a monthly two-hour testing and measurement program as part of a growth study, showed crying in the first six months was largely due to fatigue, colic, and physiologi-

cal upsets. In the study of nursery school children (Landreth, 1941) referred to below, there was significantly more crying on days on which children were sick, had colds, or had not had a bowel movement. There was also a rise in crying incidents toward the end of the morning and the end of the afternoon, presumably associated with both *fatigue* and a possible need of food. Though fatigue may not be the only factor involved, Gesell's report of infants' characteristic crying before falling asleep would seem to be additional evidence of a relationship between fatigue and crying. Gesell however interprets this behavior more in terms of resistance to losing consciousness.

Fatigue, sickness, and hunger represent some upset of physiological equilibrium. Circumstances which upset a young child's social equilibrium also result in crying. Thus after the first two years of life, crying results largely from *interference by adults or other children in child activity*. In an eight-weeks study of crying in 32 nursery school children (Landreth, 1941), 75 per cent of all incidents in the nursery school were due to children's conflicts. These were mostly over the ownership of equipment or freedom of right of way. An additional 8 per cent were due to frustration by inanimate objects (Figure 55). In children's homes, 40 per cent of their crying arose over parental insistence on observance of various health routines such as going to bed or coming into dinner at certain times and another 21 per cent arose from parental vetoes of a variety of activities including climbing on the roof and running out the gate.

Strangeness in the form of *unfamiliar persons, places and activities* also causes crying. Bayley lists in the California First Year Mental Scale "sobering to a strange adult" as a test item at 5½ months. In her report on infants' crying during test procedures, she notes that the major cause of crying in infants over six months of age was the strange tester and strange instruments or procedures.

Closely akin to the response to strangeness is that to *separation from mother and home*. A young child's response to separation from home and mother is such a familiar phenomenon it hardly requires further documentation. However, one report (Shirley, 1938), based in part on the frequency with which children cried or called for their mother as a result of their being taken from their homes to a clinic for a series of tests, revealed that tearful references to home and mother were the most frequently recorded statement.

Function of Crying

Crying appears to have doubtful value in producing external relief of the conditions causing crying. For instance, in the study

already referred to of infant crying in a hospital nursery, observers were unable one third of the time to determine the cause of crying and presumably were therefore unable to alleviate the source of distress. In the case of children's crying in the nursery school, the

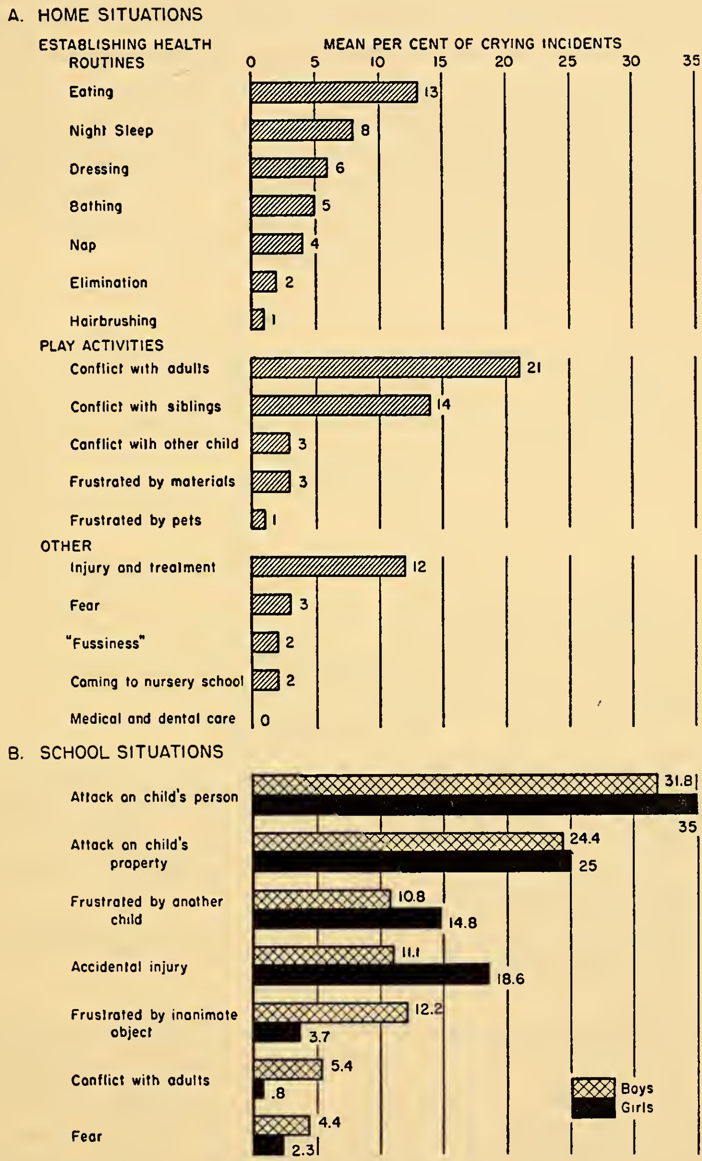

Figure 55. Causes of crying in young children in home and nursery school. From C. Landreth, "Factors Associated with Crying in Young Children in the Nursery School and the Home," *Child Develpm.*, 1941, *12*, 81–97.

children who cried most received the least adult attention (Landreth, 1941); and among children who cried on being brought to a clinic boys, who cried more than girls, referred more often to crying as inappropriate behavior.

The doubtful value of crying in eliciting sympathy and attention is apparently offset by the internal relief it brings. In a series of studies, infants and young children under experimental stress conditions showed changes in the electrical conductivity of their skins which were registered on a galvanometer as psychogalvanic responses (Figure 56). Once, however, they started to cry vigorously, no further psychogalvanic response was obtained (Jones, 1935). One function, therefore, of crying is relieving internal tension, a fact that all advocates of the value of a "good cry" have always known.

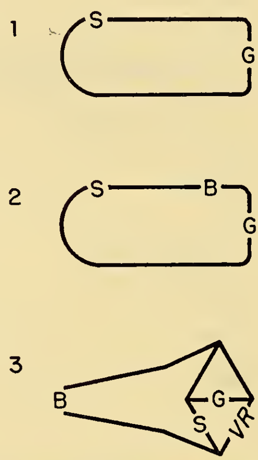

Figure 56. Equipment used in investigating psychogalvanic responses. (S) subject; (G) galvanometer; (B) battery; (VR) instrument which varies resistance to flow of electric current.
1. Simplest electric circuit for measuring psychogalvanic response
2. Electric circuit including battery
3. Circuit used by Dr. Harold E. Jones
By courtesy of Dr. Harold E. Jones, Institute of Child Welfare, University of California, Berkeley.

The effective or appropriate response to a child's crying depends on the child's age. In early infancy when the child is helpless and has no language but a cry, attention to cries establishes a means of communication. Presumably it also imparts a feeling of security or at least confidence in the standard of service the infant can expect. When the attention is effective, the cause of the distress and the means of alleviating it are revealed to the child. As children grow older, the kind of help they can use from adults therefore changes. They can

now be shown how to deal directly with their frustrations and difficulties. Thus a child screaming and tugging at a playmate who has a car he wants can be helped by being told "Ask him for it, he may give it to you," or "There is another car on the shelf."

Similarly a young child can be given insight into the relieving value of tears by being reminded, when he calls an injured friend a "cry baby," that the friend was hurt and sometimes it helps to cry when we get hurt.

Some crying arises from fear. What are characteristics of young children's fears? How do they arise and how may they be overcome or even avoided?

Fears and Anxiety

Investigations of responses to sensory stimuli suggests that sudden intense stimuli—whether light, sound, or pain—produce crying, movement, and respiratory and circulatory reactions which indicate a general "rejection" or "dissatisfaction" out of which later fear responses are differentiated.

Characteristics of Young Children's Fears

The nature of specific fears in early childhood has been studied by interviewing parents and children and by noting children's responses in experimental situations. In one study (Hagman, 1932), in which 70 mothers reported fears observed in their preschool children, the reliability of the mothers' reports was checked by asking them three months later to again list their children's fears. At this time, 63 of the 70 later lists were identical with those given earlier. In another series of studies (Jersild and Holmes, 1936), 136 mothers of children aged 12 to 97 months kept a record for one or more periods of 21 days of all manifestations of fear in their children; 398 children aged five to twelve years were interviewed concerning their fears; 1,100 fifth- and sixth-grade children checked fears that worried them against a check list of common fears; and 303 undergraduate and graduate students answered written questions concerning childhood fears they recalled.

As for the experimental tests (Holmes, 1935), 105 children, 2 to 6 years of age, were confronted by eight situations—being left alone, sudden displacement or loss of support, dark room, strange person, high place, noise, snake, large dog. Turning now to the results from these studies, as Figure 57 shows, there is a change with

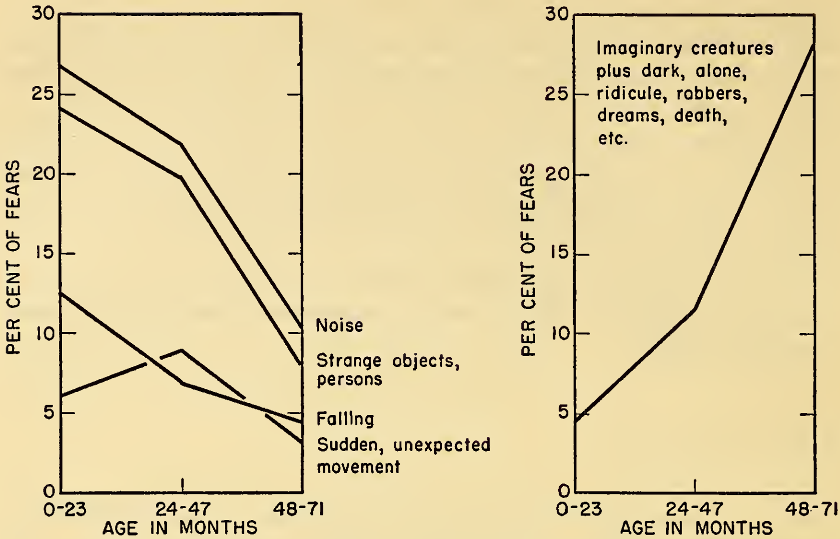

Figure 57. Some age changes in situations causing fear. Redrawn from A. L. Jersild and F. B. Holmes, "Children's Fears," *Child Develpm. Monogr.*, 1935, No. 20.

age in the situations producing fear responses: in younger children, fear is commonly aroused by intense sudden or unfamiliar stimuli; in older children, by a situation linked to the child's past experiences and dependent on some maturity of perception. For instance, noises (and agents and events associated with noise) or other sudden unexpected or novel stimuli constituted the cause of more than half of the fears in a group of infants and young children on whom a 21-day record was obtained. A similar record on the same children, 13 to 35 months later, showed that such situations now accounted for only one fifth of the children's fears. There was, however, an increase from 5 to 24 per cent in the fears attributed to anticipated dangers associated with the dark and with imaginary creatures.

There is also a change with age in the frequency of overt manifestations of fear. In the test situations, for instance, children between two and three years of age showed fear in 32 per cent of the situations, those between five and six years of age in only 4.5 per cent. These figures cannot be accepted as meaning that older children have fewer fears, but only that they have fewer specific fears that are readily observable. As we shall see later, different children manifest fear in different ways.

Meanwhile, how do such specific fears as those reported above arise? Why are some children afraid of the dark and the dog next door while others are undisturbed?

Factors Associated with the Incidence of Specific Fears

Evidence that girls are the shrinking sex is offered in a comparison of the responses of 29 boys and girls matched for age in the eight test situations already described. In this comparison the differences between girls and boys were statistically significant. Similar evidence of more overtly expressed fear in girls than in boys comes from parents' reports. There is also evidence that Miss Muffet was a typical girl in the report of country children's fear of animals (Pratt, 1945): more girls than boys were afraid of insects and spiders. What part cultural influences play in these sex differences has not been investigated, though it seems likely that being a little man in our society as opposed to being a little lady calls for more of a stiff upper lip and more of an investigatory approach to the new or the strange. *Intellectual maturity* of the type revealed in intelligence test performance is also a factor in children's fear responses to specific situations. In eight test situations in which 51 children with recent mental test scores were involved (Jersild and Holmes, 1935), a correlation of .30 was obtained between fear and IQ scores. This correlation was higher at the younger level (.53 for children 24–35 months of age) and declined to almost .00 by the age of five. This finding suggests that fear in response to certain situations is related to the maturing of intellectual abilities. A bright young child may thus perceive danger in certain situations which are not as yet feared by less intelligent children of the same age.

Further evidence of the soundness of the old saw that children sometimes don't know enough to be afraid is offered in a comparison of the reactions of children of different ages to a harmless snake (Jones, 1928); children up to the age of two years showed no fear of the snake. Similar evidence is offered in the mean age of onset of specific fears, 2 years for fear of doctors, 3 years for fear of insects (Hagman, 1932).

With increasing age children not only have greater intellectual maturity, they also have wider experience. Let us see what part learning plays in development of fears.

Any student who has ever taken a course in general psychology knows that Watson supported his statement that all fears arise through association with two innate fear-producing stimuli—sudden loud sounds and lack of support—by conditioning a fifteen-months-old boy to respond fearfully to a tame rabbit. At first the boy was unafraid of the rabbit. Several repetitions of presenting the rabbit to the accompaniment of a loud clanging noise behind the boy's head led to a fear response at the sight of the rabbit, even though no sound was made.

Though evidence does not support the existence of innate identifiable fear responses, there is no question as to the part played by conditioning in causing emotional responses. Otherwise how would we explain manifestations of fear toward men in white coats by a child who has recently been given "shots," or timidity toward all fur-bearing animals by a child who has had an unpleasant experience with a dog.

The mechanism involved in the conditioning process first reported by Pavlov in his work on dogs is well illustrated in the behavior of a fifteen-months-old child who was conditioned to respond to an electric bell as the result of its association with a mild electric shock. The experiment (Jones, 1930) was conducted while the child was playing with a grid which was wired for electric current. The child not only developed a conditioned withdrawing response to a buzzer, he also, by a process termed "irradiation" or "generalization," developed a similar response to such related stimuli as an electric bell. This phenomenon of irradiation similarly underlies a young child's generalized fear response to all furry animals and articles after he has been frightened by a dog.

The associative process may not always involve direct experience. Once children understand words, fearsome accounts of the behavior of individuals and animals may lead children to fear consequences that will never arise.

For example, in a study (Jersild and Holmes, 1935) in which 398 children aged 5–12 years were asked to report what they feared most, and what were the worst things that ever happened to them, there was (as Figure 58 shows) little correspondence between feared circumstances and the possibilities of their arising in the child's life. Only 13 per cent reported a fear of possible injury, operation, or illness, though 73 per cent reported this among their worst happenings. In contrast, 14 per cent reported a fear of attack by animals, though only 2 per cent had ever experienced any unpleasantness with them. Similarly in a study of fears of rural children (Pratt, 1945) the animal most feared by children in kindergarten and the early grades was the bear, a creature rarely encountered outside of a national park.

Another way in which fears are learned is through identification with a fearful person. In the study mentioned earlier in which mothers reported their children's fears, they also listed their own. Comparison revealed a correlation of .67 between the number of mothers' and of children's fears. Further, the mothers' fears were shared by children to a greater extent than could be accounted for on the basis of chance. While it is conceivable that a relationship between the number of

mothers' and children's fears might indicate a common genetic factor conducive to timidity, the sharing of identical fears suggests rather some identification. Such an explanation is supported by observations

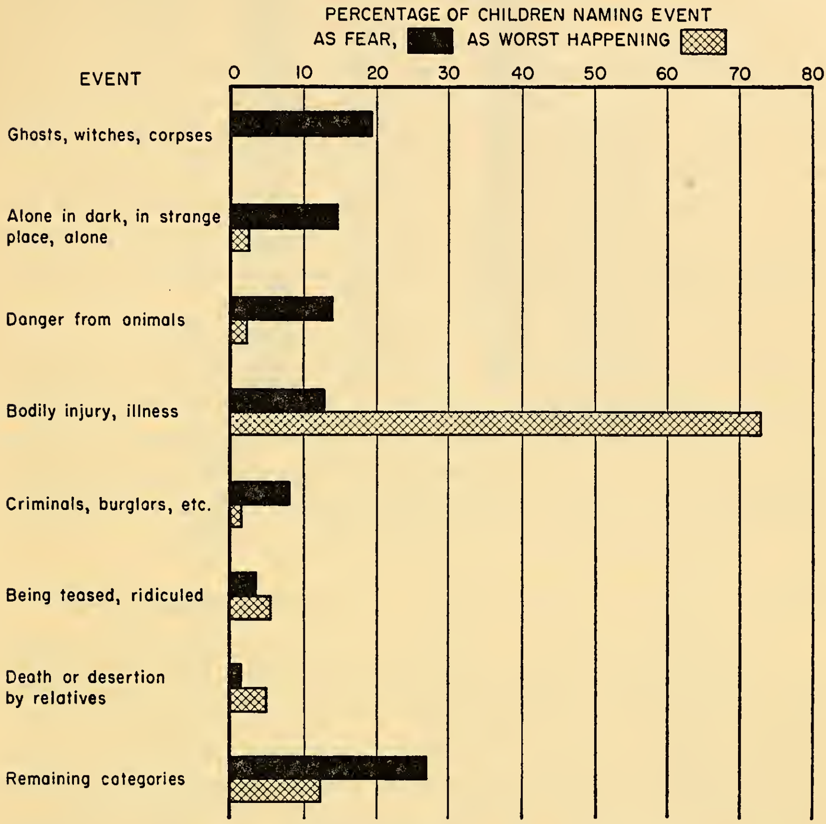

Figure 58. Comparison of children's fears and worst experiences. Drawn from data in A. L. Jersild, F. V. Markey, and C. L. Jersild, "Children's Fears, Dreams, Wishes, Day Dreams, Likes, Dislikes, Pleasant and Unpleasant Experiences," *Child Develpm. Monogr.*, 1933, No. 12.

of behavior of children in the London blitz. Those whose parents were disturbed showed more fears; those whose parents remained calm had fewer fears.

Factors Associated with the Onset of Specific Fears

Children's condition of health is apparently a predisposing factor in the onset of fears. In mothers' reports of specific fears (Hagman, 1932, Jersild and Holmes, 1935), it was noted that many arose at the time of an illness; though not all were directly related to the circumstances of the illness.

Not only is the child's physical condition a factor in onset of fears, the actual conditions under which the experience occurred are also important. In a study originally aimed at determining common causes of fear in young children, so little response was obtained to a variety of objects, including false faces and furry animals, that the investigator (Jones, 1925) tested the effect of varying the method of presentation. Using as stimuli a snake, frog, rabbit, white rat, pigeon, loud sounds, false faces, and being left alone, she presented them to 70 children aged 3 months to 7 years under the following conditions: (1) in a lighted room, (2) in a dark room, (3) when the child was alone, (4) when other children present were afraid, (5) when other children present were unafraid. The result was that children's responses varied with the method of presenting the stimulus.

It was found that the suddeness or unexpectedness of an experience or the fact that it occurred in the presence of unadjusted children was more influential in producing fear than the experience per se. The implications of this study are obvious. Warning and preparing children in reassuring ways concerning imminent unpleasant experiences will cause them to be less fearful than if you suddenly and unexpectedly spring such experiences on them.

Effective Means of Obviating or Overcoming Specific Fears

Experimental proof of the value of preparing young children for an unavoidable unpleasant experience is offered in a comparison of the adjustment to hospitalization of "prepared" and "unprepared" children. In this study (Prugh, 1953), 200 children aged 2–12 years were divided into an experimental and a control group prior to entering the hospital. The control group was given standard hospital treatment, that is, they did not have visits from their parents and the staff were not specially instructed in the psychological care of children. In contrast, everything possible was done to ease the adjustment of the children in the experimental group. Their parents were instructed in the method of "preparing" them, the children received frequent visits from the parents while they were in hospital, and the staff members who worked with the children received special instructions concerning their handling.

Comparisons of the children's immediate reaction to the hospital, their adjustment to the hospital ward, and their reactions immediately following hospitalization and three months later all indicate that time and thought given to preparing the children paid off. As Figure 59 shows, the experimental or prepared group had an easier immediate adjustment and returned to normal more quickly than the control group.

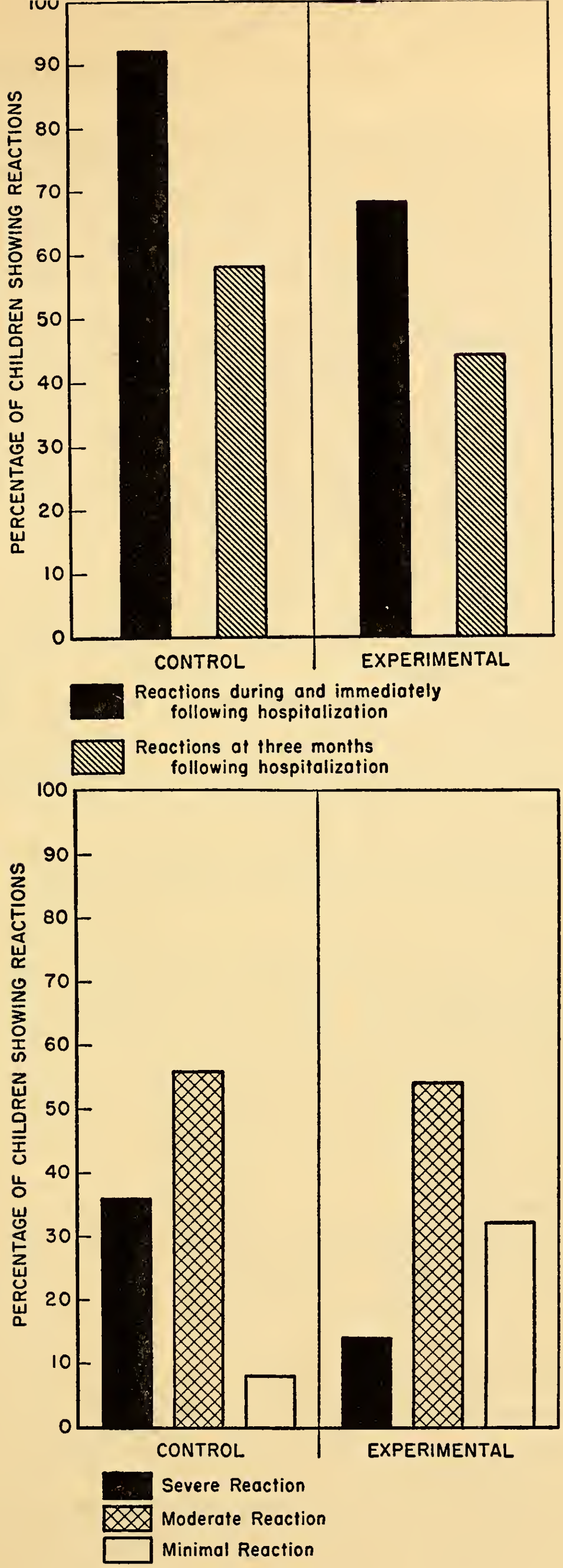

Figure 59. Reactions to hospitalization of a "prepared" and "unprepared" group of young children. Redrawn from D. G. Prugh, et al., "A Study of the Emotional Reactions of Children and Families to Hospitalization and Illness," *Amer. J. Orthopsychiat.*, 1953, *22*, 70–106.

Age as well as preparation was a factor in the children's adjustment. Three months following the children's discharge from the hospital, nearly half the children still disturbed in both the control and experimental group were under four years of age. Obviously, children under four or five years of age should be spared hospital experience unless it is absolutely necessary.

Other potentially disturbing situations may be similarly handled. A mother's absence in hospital during childbirth may be prepared for as described in a child's book *The New Baby* in Simon and Schuster's Golden Book Series. In this story, a well-loved aunt arrives a few days before the child's mother leaves for hospital. The days during the mother's absence are busy with familiar routines in a familiar setting and the father's daily reports and messages keep an unbroken contact between the child and mother.

The first days in nursery school are likewise eased by current nursery school practices. Thus the nursery school teacher visits the child in his home so that he meets a new person in a familiar setting. Later the child makes a brief visit with his mother to the nursery school and becomes familiar with all its physical facilities. Then on the first days his mother comes to school too, withdrawing herself gradually from the play area as her child becomes able to play without constantly reassuring himself that she is still there.

What of methods of overcoming established fears?

Parents reporting their children's fears (Jersild and Holmes, 1935), listed the methods by which some were overcome. These were, in order of their effectiveness: specific attempts to promote skills, providing opportunities for child to grow acquainted with feared situation, graded presentation of fear-producing stimuli, positive but passive "conditioning," verbal explanation and reassurance, example of fearlessness in others, ignoring the fear, enforced contact with or participating in feared situation, removing the cause of the fear or introducing palliatives.

In an experimental situation (Jersild and Holmes, 1935) in which some children showed fearfulness in entering a dark room and walking across a raised board, they were effectively helped to overcome their fears by a procedure which Jersild describes as "helping the child to acquire competence in coping directly with a feared situation." As illustration, the children who were afraid of entering a dark room were encouraged to do so by having their attention drawn to a phosphorescent pendant attached to an extended light chain that hung down fourteen feet from the entrance to the room. The experimenter asked each child to go into the room and turn on the light. After the child felt his way in the room, he finally saw the phosphorescent

pendant and was asked to pull it, thus turning on the light. With the light on, the child was encouraged to play with a puzzle for a few minutes and then asked to leave and turn off the light before doing so. The experimenter then said, "Now you'll know where to find the light the next time you come."

This was repeated and the child was urged to enter and turn on the light by himself, until he would do so voluntarily.

As desperation often induces adults to resort to a variety of methods (some of them of a rigorous sink-or-swim variety) in overcoming fears in young children, a comparison of the efficacy of different methods is of interest.

In a study (Jones, 1924), involving 70 children three months to 7 years of age, an investigator tried the following method in overcoming fear of furry animals—showing pictures and telling stories about animals, ridiculing the child, forcing repeated exposures to animals, eliminating all contact with animals, exposing child to feared animals in the presence of an unafraid child, and reconditioning or associating the feared object with something pleasant. Under these circumstances, only reconditioning and social example were effective and of the two, reconditioning was much more effective.

In a detailed account (Landreth, 1942) of removing a specific fear by reconditioning, the following report illustrates some of the general principles on which effective reconditioning is based.

> At a parent's meeting in a nursery school of a small southern college, children's fears were being discussed. One of the mothers reported herself baffled by a fear of the barber shop which her child had recently developed. From the age of thirteen months her son, now eighteen months, had been barbered at regular intervals. This he had apparently enjoyed. At sixteen months he had been given "shots" of some kind from the doctor. On his first trip to the barber's after this experience he cried and struggled as soon as he set foot inside the barber's door. The barber's staff, with more vigor than insight, laid firm hands on him and removed his hair notwithstanding. By his mother's report this was a difficult experience for all concerned.
>
> On his next trip his father went with him taking him to a different barber and planning to have his own hair cut first. The result was lamentable. The child's outcries filled the main street. The operation finished with an apoplectic child, a wilted barber, and a father with his hair still uncut.
>
> To bring the matter to a head, the maternal grandmother, who had never seen her grandson, was arriving in four days. Was there any way of removing hair and fear in the interval?
>
> The teacher saw that Bud was not the only member of the family who had undergone a "conditioning" process. She also knew that his mother was a secretary with limited time at her disposal, so she volunteered to take over the problem.
>
> Having decided that the points of similarity between the two situa-

tions were probably white paint, nickel trim, instruments, and a man in a white coat, Miss L. laid her plans accordingly. She first paid a short visit to the barber. Next morning when she and her assistant, Miss W., called for the children in the school car she had it stop at the post office. She got out and asked Bud to come in with her. He carried in her letters, dropped them in the box, waved to the postman, and got pleasantly back to the car. At school Miss L. and Miss W. fastened themselves into white uniforms stiff with starch and buttons in place of their customary flowered smocks. Some of the children commented on their change in appearance but Bud paid no attention. Ordinarily the very small children (there were three under two years) did not use the scissors. This morning scissors and colored paper were put on the table in their room. While they were playing with these, Miss L. sat down beside them with some paper and dressmaking shears and did a little noisy cutting of her own, rousing as far as could be detected nothing more than mild interest on Bud's part. With the scissors there was a small hand hair-clipper, and when Bud and his friend Bill (also eighteen months) were turning it over she showed them how it worked, and made a few illustrative snicks at Bill's hair. Again, the situation aroused only mild interest.

When the children were playing in the sandbox, she brought out one of their white cotton sheets and asked Bill if he would like her to wrap him up. Bill was a docile child who was willing to stand anything in reason from a well-meaning and presumably kindly intentioned adult. Also he was temporarily sated with sand, so out he came. Miss L. wrapped him with a flourish, smiled, and sat him on a box.

"Look, Miss W.," she said, "here's Bill all wrapped up." Miss W.'s smile and interest acknowledged that wrapping up was a very engaging procedure. Miss L. asked Bud if he would like a turn. He came out, was wrapped up and perched on the box for Miss W.'s inspection. Again no signs of fear. Bud was unenthusiastic but pleasantly cooperative.

That noon as the children were taken home, the car stopped outside the barber's shop. Miss L. got out as she had in the morning and asked Bud to come in with her, assuming that they would make a pleasant two-minute call. Bud put his foot out, looked up, saw where the car had stopped, drew his foot in again, and said, "No—no," and started to cry.

This was a distinct set-back after the smoothness of the morning program, but Miss L. said with reassuring hopefulness, "All right, tomorrow," and went in to the barber, who said this was just what he expected. However, he came out to his doorway, and as she got in the car Miss W. said to Bud, "Wouldn't you like to say 'Bye-bye' to the barber?" As the only sort of dealings, social or tonsorial, Bud wanted to have with the barber was to say "Bye-bye" and then "Bye-bye" rapidly, the car drove off with cordial mutual farewells.

Next day was the second day. As the car drove by in the morning, the barber was in his shop window. He waved and the children waved. At noon, going home, the car stopped again. This time Miss L. asked Bill first if he would like to come in with her, and then held out her hand for Bud. At the door his fingers tightened a little, and she lifted him up judging that the situation viewed from an altitude of five-foot-six might look a little more acceptable than it had from

his original two-foot-six. Inside the door he gave one look at the barber, clutched Miss L. tightly around the neck, and said, "Bye-bye." The barber and Miss L., however, stood their ground.

He said it was a nice day. She remarked on his large wall clock. Bud had a distinct weakness for clockwork, and she moved a little nearer. "Your clock says 'tick-tock,' " she said to the barber. He said, yes, he'd noticed that too. They exchanged laudatory remarks about the excellence of his mirrors and chairs and again Miss L. suggested that Bud say "Bye-bye." He revived immediately and they left the shop to a chorus of "Bye-bye."

Next day was the third day and a school holiday. Bud's grandmother was to arrive the next morning. Miss L. and Miss W. called first for Bill, who was on the most cordial terms with the barber, and then for Bud.

This time they crossed the doorway without incident. The barber was busy shaving a man in the window and paid no attention to them. In the chair next to the shaving operations was Bud's paternal uncle, almost completely screened by the morning newspaper. As Miss L. surmised then and learned later, he was on hand so that if the worst came to the worst the hair would be removed if not the fear.

His presence was a reminder that though inside there was still quite a way to go. Miss L. sat down in one of the chairs and said, "Miss W., this chair turns around!" and turned around once for her benefit. Miss W. said, "What a nice ride you're having. Wouldn't Bill like one too?" Bill climbed up and he and Miss L. revolved before Miss W.'s appreciative gaze.

Miss L. suggested that Miss W. would also like a ride, and she admitted that she had been craving such an opportunity. As she seated herself, she suggested that of course Bud would want a ride too, and helped him up onto her knee.

As they were successfully completing the second revolution the barber came over. He had been watching their technique and said, "My chairs ride up and down too." While Miss W. and Miss L. registered appropriate appreciation for the versatility of his furnishings, he deftly raised and lowered the chair and adjusted it to working height, and then reached for his cloth. "Let me," said Miss L., and, smiling on Bud, she told him she was going to wrap him up. Miss W. suggested that if he turned around on her knee he would be able to watch himself in her pocket-book mirror.

From then on, the hair-cutting proceeded smoothly and pleasantly and without interruption save from the paternal uncle who came out of ambush to advise that Bill, in undertaking an exploratory survey of the barber's cabinet, was "fixing" to drink some of his hair tonic. Bill was immediately "unfixed" and the now sleek-headed Bud returned to his home, with a suggestion that his mother have him call casually at the barber's sometime before his next haircut.

Readers may feel that the writer spent more time than most adults would be willing to devote to such an enterprise. Actually what was done was all a part and merely a modification of the procedure of a child's nursery school day. That a little time and thought spent this way is a saving in long time wear and tear is indicated in another experience of the same writer.

Some years later while in a hair dressing cubicle, she heard a child's screams which followed a recurring pattern of a mounting crescendo

> to a sharp shriek, followed by a sobbing diminuendo. The attendant explained, "You'd never guess," she said, "There's a small boy out there having his hair cut. His father is holding him in his arms, and walking around the room. The barber is creeping up on them from behind taking a quick snip between screams. Isn't that something?"

It was—something that could have been handled better.

So far we have dealt only with specific fears of an episodic sort. Is there any evidence of general fearfulness or anxiety in young children? Psychoanalytic theory is virtually predicated on the existence of universal innate fears in early childhood. Early childhood is in fact conceived as the period in which the neuroses of adulthood have their origin, and this origin is grounded in fear: fear of castration, fear of punishment, fear of loss of love, and fear of father's competition for mother's love. Anna Freud speaks of the essential factors in children's teachability as their fear of punishment and fear of loss of love. Sullivan (1947) writes of the anxiety induced in infants by awareness of their dependency. Other child psychiatrists describe anxiety arising from children's fear of instinctively expressing their feelings of aggression (Pearson, 1949). Therapy is therefore directed in part to helping children to accept and understand these feelings.

Though no close observer of young children is under any illusion that early childhood is a halcyon period of carefree existence, have we, on the other hand, evidence to prove that it is as hag-ridden by vague fears as some writers would have us believe?

Taking first the fear of castration, some investigators (Sears, 1943, Conn, 1940) find no objective evidence of such fear in American children. As to fear of punishment, a study (Sears, 1953) which showed different phantasy behavior occurring in children typically punished by different methods—harsh physical punishment versus mild verbal control—suggests that children's feelings are based on actual experience with punishment rather than on some innate universal dread.

Concerning the existence of the oedipal complex, with its attendant fear, here again evidence from other cultures in which fathers play a somewhat different social role suggests that experience is also a factor. Similarly, fear of loss of love can hardly be conceived of apart from a young child's actual experience. Actually, in contemporary American society, customs in child care are being constantly modified by the pronouncements of the very people who seek to study them. Loving and literate American parents are thus busily invalidating the sort of pronouncements which may justifiably have been made on the basis of memories of neurotic adults in Vienna in the nineteenth century.

This does not mean that even the loving and literate are smoothing all difficulties from the path of early childhood. In a study (Temple, 1944) designed to test evidence of anxiety, 24 preschool children were shown pictures like those in Figure 60 and asked which head they would like to put on. Children's responses in putting in unhappy faces in neutral situations was interpreted as evidence of anxiety, particularly as children's scores correlated .59 with ratings for anxiety made by their teachers.

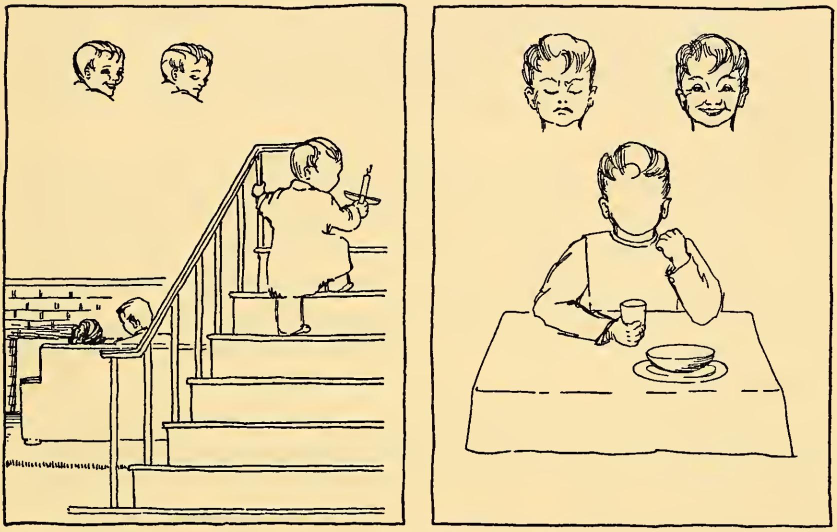

Figure 60. Pictures and insets used in investigating anxiety in young children. Drawn from plate by M. Dorkay and E. W. Amen, "A Continuation Study of Anxiety Reactions in Young Children by Means of a Projective Technique," *Genet. Psychol. Monogr.*, 1947, *35*, 139–183.

The fact that pictures showing parent-child interaction evoked more anxiety responses than those showing child-child interaction raises a question as to why this should be so. An answer is suggested in a developmental study of the behavior problems of normal children (Macfarlane, 1954). At the five-year level there were 49 significant correlations between behavior problems for girls, only 17 for boys. As the behaviors between which significant correlations were obtained included instability, overdependence, mood swings, somberness, tempers, timidity, and poor appetities, it would seem a fair assumption that this complex of relationships was pervaded by anxiety.

Why was it manifest in girls but not in boys? The investigator suggests that mothers require a higher standard of conforming from girls than they do from boys and that as a result girls develop

anxiety in trying to meet these high behavior expectations. This suggested relationship between mothers' behavior standards and children's anxiety probably also accounts for the fact that sex differences in manifestations of anxiety are less marked in second-born than in first-born girls. Presumably mothers relax standards for the second-born as a result of greater experience with developmental levels of behavior.

What we need now are further studies which investigate relationships between anxiety in children and different types of childhood experience. In making such studies, tests of anxiety already used with adults could be modified. Among these are tests of the ease of conditioning and generalizing of conditioning. It has been suggested that the anxious establish a conditioned response more readily and that they generalize a conditioned response to a number of similar situations.

What we know then of young children's fears and anxieties is that while children appear particularly vulnerable to certain fear-inducing experiences at certain ages, parents can exercise some control over whether their children will have such experiences, and whether the experiences will be presented in a fear-inducing way.

Parents however need to be perceptive in assessing possible sources of anxiety.

A mother who was breaking in a new baby sitter and household helper had to leave the house, unexpectedly, for an entire morning. After giving the sitter some hurried directions, she turned to her four-year-old daughter and said, "Maybe I haven't told Mrs. S. everything she needs to know, but I know you can answer any of her questions." To this the little girl gave her mother a worried look and said, "But what if she asks me what is a factory?"

In these days of $64,000 questions, how was a little girl to be sure queries would remain on a simple "where are the dish towels kept?" level.

Turning now from fear to anger, what circumstances cause anger in young children, and how do the circumstances that cause it, and the way it is expressed, change as children grow older and have different experiences?

Anger, Hostility, and Resentment

Anger-provoking stimuli

Watson postulated an innate anger stimulus-response pattern of slashing movements, holding the breath, and crying in response to restraint of movement. Subsequent experiments (Dennis, 1940b) have

failed to confirm this observation. In fact, Irwin's (1934) report that infants cried less when clothed than unclothed even suggests that some forms of restraint may have a calming action.

As for stimuli arousing anger outbursts in children beyond infancy, a report (Goodenough, 1931a) based on records kept by 45 mothers of children aged 7 months to 7 years 10 months, revealed the most common causes to be frustration of some sort, such as parental restriction of children's activities and parental attempts to establish acceptable eating, sleeping, and elimination habits. These are very similar situations to those associated with crying outbursts (Landreth, 1941) at home in a two- to five-year-old group of children whose parents, like those in Goodenough's study, were a college-educated group.

As Landreth's study was made ten years later than Goodenough's, it seems likely that establishing routine habits and instilling some regard for personal and property rights and for safety are continuing sources of frustration for children in upper middle class families. This suggests that parents might benefit from help in the development of child guidance procedures. Certainly studies of teacher-child contacts in nursery schools (Landreth, 1943) demonstrate that child behavior can be modified with less friction and frustration than is the rule in most homes. As for anger outbursts in the nursery school, two studies (Ricketts, 1934, and Landreth, 1941) indicate that from two thirds to three fourths of these arise from conflict with other children.

Expression of Anger

As specific emotions become identifiable during the second six months of life, some diversity in their overt expression is also apparent. Thus some children learn that a scowl, a sulk, or some form of social withdrawal serves the purposes of anger better than battering blows or shrill screams.

Anger may be internalized as well as externalized. Cannons' (1929) description of a cat experimentally confronted by a dog included an x-ray plate of its swiftly halted stomach contractions as well as its arched back, erect fur, and unsheathed claws. Circulatory, respiratory, gastrointestinal and other physiological changes may thus either accompany or replace overt expressions of anger.

Evidence that acceptable social adjustment is associated with some internalizing of anger and other emotional reactions is offered in an interesting comparison of adolescent boys' psychogalvanic response to an emotionally disturbing situation (Jones, 1935). Boys who gave the largest P.G.R. were rated by adult observers as calm, deliberative,

good natured, cooperative, responsible, and restrained. Those who gave the smallest P.G.R. were rated as uninhibited show-offs, easily excitable, unstable, impulsive, and irresponsible.

Anger reactions may also find an outlet in fantasy. Thus, in a comparison (Sears, 1953) of the behavior of young children who received different types of punishment, those severely punished showed more fantasy aggression in doll play situations than those not treated in this way.

What determines the form of anger responses in individual children?

Age and Sex Differences in Anger Behavior

In Goodenough's study, anger outbursts reached a peak at 18 months. With increasing age there was a change both in the frequency of outbursts and in the types of situations that set one off. Thus, under one year, outbursts were associated with direct interference with physical activity; later they were largely associated with thwarting the child's plans, and criticizing his ideas.

Anger was also expressed differently, the younger children tending to have tantrums or directionless explosions of crying and activity, the older children showing more delayed behavior retaliating against the person associated with frustration. Of this sort is that of the four-year-old girl whose mother punished her by shutting her in a clothes closet. After a rather long silence, the mother enquired from her side of the door, "What are you doing?" The child said, "I've spat on your hat, I've spat on your coat, I've spat on your shoes. Now I'm waiting for more spit." Whatever else can be said of this response, it does show greater maturity than that of an enraged floor-kicking, head-banging two-year-old.

The boys in Goodenough's study had more frequent anger outbursts than the girls. This sex difference was also found in a study of children's behavior (Macfarlane, 1953), in which parents rated children on a five-point scale on frequency of temper tantrums. There were not only more temper tantrums in boys than girls, they seemed to have a somewhat different significance. For instance, temper tantrums in five-year-old girls were significantly correlated with such other forms of behavior as irritability, overdependence, insufficient appetite, somberness, negativism, attention-demanding, and fears. In five-year-old boys the only behavior significantly correlated with temper tantrums was negativism. This suggests that tempers are more symptomatic of a generally disturbed state in girls than boys, and that outbursts of temper in boys receive less social disapproval than they do in girls.

Obviously such sex differences must be influenced by environmental and constitutional factors.

Environmental and Constitutional Factors Associated with Frequency of Anger Outbursts

The environmental factor one would expect to have the most bearing on anger outbursts is the responses they receive. Goodenough reports that children who had the most outbursts most often got their own way; in other words, the outbursts served a purpose. Similar evidence of a relationship between outbursts and responses can be traced in the sex differences in anger outbursts. In studies which will be discussed later, it will be found that mothers are more permissive and less frustrating in their treatment of sons than they are of daughters (Macfarlane, 1954, Sears, 1953).

The part that frustrating life circumstances play in the frequency of anger outbursts is suggested by the fact that conflicts and outbursts of anger are more frequent among nursery school children in a small play place compared with those in a larger space (Jersild, et al., 1935). There were also more outbursts of anger in children with more than two adults in the home (Goodenough, 1931a).

Popular observation that children are more touchy when tired or sick is also borne out in Goodenough's study. The number of anger outbursts mounted toward the end of the morning and the afternoon, and there were more outbursts on days when children were sick or irregular in bowel functioning. In Macfarlane's developmental study, there is similar evidence. Tempers were significantly correlated with illness in girls ($r = .41$ at 21 months) and with insufficient appetite ($r = .40$ at five years).

Evidence of Free Anger, Resentment, and Hostility in Young Children

At first glance young children appear to be creatures of the moment, living solely in the immediate present. It is difficult, therefore, to associate them with a brooding sense of wrong or a desire to get even. Sears' study (1946) dispels such an illusion by making it clear that even young children harbor anger and hostility which find outlets in fantasy and projective doll play. Clinical case studies present a similar picture. Two prepared as films from actual cases suggest the complexities in motivation and manifestation of anger. In one, "Angry Boy," apparently unprovoked outbursts of anger and hostility are traced to a domineering parent-child relationship. In another, "Feeling

of Rejection," a girl's hostility finds expression in compulsive competition for status, apparently taking this form because such behavior is acceptable to her parents.

The subjective feelings of anger in young children can only be inferred from their behavior. Even in early childhood one senses nuances in emotions, rarely blind rampant rage, but anger mixed with feelings of frustration or of being wronged.

As all children will unavoidably meet a certain amount of frustration and injustice, it is worth considering whether anything can be done to help them handle their feelings and give them acceptable expression. First, of course, something can be done to reduce frustration from the physical environment by making reasonable provision for freedom of movement, by fostering children's ability to take care of their own needs, and by giving them socially acceptable outlets for their developing abilities. Frustration from the social environment can be similarly reduced by consistent predictable handling and by simple clearly stated rules concerning safety and treatment of persons and property. In this connection, it is of interest that in Macfarlane's study there was a correlation of .22 between children's temper tantrums and their mothers' inability to express themselves clearly.

For the rest, as studies to be discussed shortly will show, tacit acceptance of children's *feelings* can be accompanied by suggestions, questions, and encouragement aimed at modifying their *expression* of these feelings. For example, a child who fumes in helpless anger because he can't finish a puzzle can be offered the suggestion "You might try that piece over there," the question "Have you tried it turned around?" or the encouragement, "You've got just one piece left. Keep trying it some more ways, you'll finish." In this way a child learns to find a realistic solution to the real cause of his problem. In less direct ways children can be given opportunities to work off any accumulated steam in acceptable ways through pounding, sawing, and hammering at a carpentry bench or scribbling and smearing at the art work tables.

Anger and fear are both a part of jealousy, an emotion which young children can hardly avoid in sharing their parents' love with brothers and sisters. In the words of the French proverb, "where there is no jealousy, there is no love." The jealousy of early childhood is thus so general that it has its own term "sibling rivalry." This does not mean, however, that all jealousy is of a child-child type.

A grandmother was recently visiting her son's family. The family included a three-year-old boy who had never seen his grandmother. Her visit interrupted his late afternoon schedule of a story and man

to man period with his father. On the third afternoon when the adults were sitting over a glass of sherry in the living room, the grandson said in a clear to whom it may concern voice, "There are too many people in this room."

Jealousy

Motivations

Jealousy has been studied by comparing the behavior and circumstances of groups of children reported by their mothers to be jealous with other groups reported as non-jealous. In the studies reported (Foster, 1927, 150 children, 1–12 years; Ross, 1931, 166 children, 3–16 years; Sewall, 1930, 70 children, 1–6 years), groups were drawn from clinic patients.

Distinguishing characteristics of jealous children in these groups can be summed up in the following generalizations. Girls are more likely to be jealous than boys. First-born are more likely to be jealous than children of later birth orders; hence jealousy tends to decrease as size of family increases. Jealousy is more likely to occur with age differences between siblings of 18 to 42 months, and more likely to occur toward a younger brother than a younger sister.

All of these relationships of jealousy with sex, birth order, and sex of sibling suggest underlying social factors in parents', particularly mothers', treatment of girls and boys and first and later born children. Other evidence of relationships between home background and jealousy is offered in the greater frequency of jealousy in homes in which parents are rated as oversolicitous (80 per cent jealous) and inconsistent (80 per cent jealous). Similarly, in families rated as poorly adjusted, 63 per cent of the children were jealous, compared with 10 per cent in families rated as being well adjusted (Sewall, 1930). The factors making for jealousy thus seem to arise from the character of the parent-child relationship.

The sheer fact of being informed in advance of a baby's arrival did not appear to influence the older child's response, as the forewarned included as many jealous children as those who had no advance notice (Sewall, 1930). What one would like to see is some study of the effects of different methods of preparation. Obviously "preparing" a child by telling him he will have his nose put out of joint when the new baby arrives will do nothing to insure a baby's welcome. In contrast, letting a child help with preparations for the new baby and giving him opportunities to see what young babies look like and what kind of care they need could reasonably be expected to produce a different frame of mind.

Studies of any kind of behavior based on a comparison of characteristics of those with and those without the behavior leave many questions unanswered, since any behavior may be a result of different circumstances. Whatever the dynamics of jealousy, there is evidence that children have justification in looking with disfavor on a new arrival. In a study in which homes were rated on their social characteristics (Baldwin, 1947), a decrease in their "child centeredness" occurred during and after pregnancy.

Manifestations of Jealousy

Reported instances of jealousy range from bodily attacks on the younger sibling, ignoring his presence, denying having a younger sibling, and undergoing personality changes at the time of the sibling's birth. The relief a child may experience from acceptance of these jealous feelings combined with an opportunity for socially acceptable and freely experienced direct aggression is described in a report of the behavior of jealous children in therapeutic play sessions (Levy, 1936, 127 children, 2–14 years). In these play sessions children were encouraged to act as they wished toward a mother doll nursing a baby doll at her breast while a child the age and sex of the subject looked on. Children's hostility under these circumstances is described in terms of *direction*—self, other doll family member, or examiner; in terms of *forms*—squealing, biting, self-punishment ("she was bad"); of *prevention*—withdrawing or leaving room; of *restitution*—putting baby back at mother's breast after attacking it; and *self-justification*—"one house can't have two babies." Though no quantitative data are offered, the experimenter concludes: "a free release of hostile feeling in the experimental situation *apparently* has a beneficial effect on the actual sibling relationship in *many* cases."

Obviously such a procedure requires psychiatric service, which raises the question of whether there are any measures *parents* can take to reduce the sources and concomitants of jealousy. Obviously jealousy is associated with some insecurity concerning parental affection. Therefore, the whole quality of the parent-child relationship is involved. At a procedural level, a child could be helped by being informed of a new family member's arrival shortly before the event. He might also be prepared by seeing new babies and the kind of care they need so that he is not disappointed in his expectations. Further the new baby can be made something of an asset by letting the child have some part in preparing for him and later, if he wishes, some share in caring for him.

At this time too a child can learn that being older has its advantages in freedom of activity, play with friends, eating at table with parents, and enjoying an association that is unique to himself and his age. Finally, parents can accept their child's *feelings* of jealousy while modifying its *expression* into socially acceptable forms.

Crying, fear, anger, and jealousy often involve feelings of frustration and failure. A study of children's responses in frustrating situations therefore, reveals something of the dynamics of their behavior.

Children's Responses to Failure

How do young children respond to failure? What accounts for differences in response? Can unproductive behavior be modified by adult procedure? These were the questions a study made in the thirties (Keister, 1938) attempted to answer. Eighty-two children (3.2–5.11 years) were confronted by two test situations in which they could not succeed, and in which their failure was clearly apparent to them. In one test (Figure 61), children were asked to put pieces of a puzzle back in a tightly fitting box. In another they were asked to get a toy under a cylinder weighing 10–90 pounds. The children's overt response in these situations was recorded as well as the length of time they persisted. As a result, 18 per cent of children were classified as having made a poor response. Bases for this classification were that these children's behavior included two or more immature responses such as retreating from the task, rationalizing, destructive acts, making numerous requests for help, and exaggerated emotional responses such as crying, sulkiness, etc. Twelve of the fifteen children who made a poor response to failure were then treated to a training program designed to encourage a more constructive response. In periods ranging from 8 to 33 minutes children worked with the tester in making puzzles in a book in which the level of difficulty gradually progressed. Children also copied three-foot block figures. Procedures used by the tester were those of suggestion, encouragement, and approval. She made such remarks as "I won't need to help you. You can do it all by yourself if you keep trying. Try that piece some more different ways. You"ll find out soon by yourself how it goes. Good for you, you kept right on trying until you found the way to do it, didn't you? That was fine. You're learning to try hard and not have anyone help you."

At the conclusion of the training period, children were again presented by the tester with the two failure tests. This time there were

Figure 61. A box and blocks used in testing young children's responses to failure. Redrawn from M. E. Keister, "The Behavior of Young Children in Failure," Univ. Iowa *Stud. Child Welfare,* 1938, *14,* 27–82. University of Iowa Press.

no significant differences between the behavior of the trained children who had previously behaved immaturely and the other children who had not behaved in such exaggerated fashion. The fact that some of the nontrained now showed some undesirable behavior suggests that length of attendance in nursery school did not in itself modify children's responses; rather it was the direct training they were given over a six-weeks period.

Failure involves an element of frustration in that a purpose is not achieved. In addition to the study of failure just reported, several others have been made which measure in some way children's response to frustration imposed by persons, objects, or the child's own incapacity. These studies have with one exception been made in experimental situations. Since it is always difficult to ensure comparable motivation in young child subjects in experiments, results must be accepted with this limitation in mind.

Responses to Frustration

One study suggests that frustration with regard to a particular activity leads to a lower level of functioning, or regression, in a majority of young children. In this study (Barker, 1941), 30 nursery school children were brought singly into a playroom with various play objects available on three mats on the floor. Children were invited to play, and the experimenter, explaining he had work to do, unobtrusively rated the constructiveness of their play on a 7-point scale. Examples of scale-rating for play with a wagon were: (1) examined superficially, (2) moved from one place to another, (3) more complicated manipulation, (4) trailer attached, (5) used to haul things, (6) extensive trip, (7) unusual originality.

After an interval of 30 minutes, the experimenter raised an opaque screen in the room to reveal another area containing such attractive equipment as a big dollhouse with electric lights which was large enough to admit a child, a table set for a child's party, a toy lake filled with real water, etc. The play materials on the three mats were picked up and incorporated into this setting. The child's attention was directed to the various things to play with and the experimenter again withdrew to do his work. As soon as the child was actively absorbed in the situation, the experimenter came forward and said "we have to leave now," gathered up the toys belonging to the other part of the room, replaced them on their mats, and led the child to them. He then pulled down a wire mesh screen which shut the child out of the attractive play area, but left it clearly visible to him. Again the experimenter recorded the constructiveness of play activity in addition to other behavior such as wandering about, attracting the experimenter's attention and attempting to secure his help, and reacting emotionally.

As the rating scores below show, the children as a group regressed in constructiveness.

Constructiveness in free-play situation	mean score	4.99
Constructiveness in frustration-play situation	mean score	3.94
Difference		1.05
Standard error		.24

Actually 22 regressed, 3 did not change, and 5 improved their score.

Some indication of the extent of regression was obtained by cal-

culating age levels for constructiveness in play. On this basis, regression during frustration was estimated as 17.3 months.

These findings are pretty much in accord with one's everyday experience and are echoed in parents' exasperated comments that a teenage son is acting *like a two-year-old* when he can't get the family car. Regression is, however, not the only response to frustration. Age and maturity differences in response are reflected in an experiment (Rosenzweig, 1933) in which children succeeded with one jigsaw puzzle and failed with another. Then it was noted which puzzle they chose to play with. It was found that the younger children generally chose the puzzle with which they had previously been successful; the older children, to a greater extent, chose the one in which they had previously failed. Interpreting these results, the experimenter suggests that there is an increase in frustration tolerance with age, and that this tolerance is developed as a result of children's graded experience with frustrations which they can successfully resolve.

Personality differences also are reflected in responses to frustration. A film, "Frustration Play Techniques" (New York University Library), reveals different kinds of behavior in young children when an attractive toy is taken away from them and a stick offered as substitute and when they are blocked in pushing a small wheel toy along a track. Some children reacted emotionally by hitting the experimenter, some sought a realistic solution to the frustrating situation, and some withdrew from it. Another film, "So This Is Robert," suggests one factor in these frustration responses. Robert, who is subject to continuing frustration at home in the form of inconsistent handling by five adults, shows an exceptionally low tolerance for any kind of frustrating circumstance. Later, when some of the sources of frustration in his home circumstances have been removed, he appears better able to cope with minor frustrations at school.

Interactions between factors rather than any specific factor in a frustrating situation were shown, in another study (Davison, 1957), to determine children's response. It was found, for instance, that when children persisted in a frustrating situation with little success, their behavior became disturbed and disorganized. When they had a measure of success or were less persistent, they responded to the frustrating situation in a more rational way.

The agent of frustration was also a factor in their response. They showed a higher frustration tolerance when balked by objects than by persons, and were less emotionally disturbed when frustrated by a teacher than by a child. In brief, this study suggests that the influence of frustration on a young child depends on the characteristics of the frustrating situation and of the child.

The implication from existing studies for developing socially acceptable attitudes to frustration and failure is that young children should be given many opportunities to succeed in their undertakings. This means providing them with play materials and experiences which challenge their skills but are within their capacity to perform. It also means that when an adult is helping children, the child should add the finishing touch—fasten the last button, put the last piece of puzzle in place, and pick up the last toy when putting away playthings. Giving help and encouragement likewise helps a child learn to persist in the face of difficulties; a reminder "you are almost finished, just one button to fasten" may mean the difference between giving up or finishing up. Referring to what a child can do rather than dwelling on what he can't has a similar effect; this is well illustrated in a child's story book *Is It Hard, Is It Easy?* which indicates that all creatures enjoy a measure of success and failure. Further, if an adult asks questions rather than giving directions when a child is confronted by a problem, the child learns to locate the source of difficulties—"which shoe for this foot?" rather than "this is the shoe."

Fostering the child's development of skill and knowledge so that he is reasonably independent in taking care of his own affairs has a similar value. Finally, adapting and revising rules to keep pace with a child's developing skills and understanding keeps both functioning at capacity level. Thus a child who has demonstrated his dependability in not running into the street is permitted to go to a neighbor's house in the block unaccompanied.

Disturbing emotions have been dealt with first because they are more readily identifiable in their disruption of a prevailing neutral feeling. The pleasant emotions are less discernible because they involve less observable change in this neutral state.

Laughter and Smiling

The first smile appears at two months, in response to a front view of a human face or even to a nodding puppet head the size of a human face (Spitz, 1946). The first laugh is reported at three months (Washburn, 1929) in response to a chirruping sound made by an experimenter as he bends over the infant. These evidences of pleasure are therefore produced by social stimuli, since even the response to the puppet head involves some association with a social stimulus.

In the first five months of life, the child smiles or laughs at friendly or unfriendly faces and voices. After this time he smiles and

laughs only to friendly faces and voices. With increasing age there is an increase in the frequency of smiling. The situations evoking smiles also change. In a study involving a few nursery school children (Ames, 1949), those eighteen months old smiled most at their own gross motor activity; at two and two and a half, social approaches to or from the teacher evoked the most smiles; and at three and a half, social contacts with other children were most productive of smiles.

As to laughing, observations of laughter in nursery schools reveal that children laugh more in the presence of others. They laugh most in response to and as an accompaniment to their own activities, suggesting that laughter may be a more primitive and less social response than smiling. Other sources of laughter are revealed in a diverting series of experiments which throw some light on the humor of early childhood (Justin, 1932, 96 children, 3–6 years). Unfortunately we have no Hooper ratings for different situations presented to children of different ages, different sexes, different intelligence, different personality characteristics, and different cultural backgrounds. Therefore, we cannot ascribe developmental or other significance to these mirth-provoking situations. All we know is that the following situations were all good for a laugh in the group tested.

(1) Surprise and defeated expectation. After putting his hand into a pail containing sand and into another containing water, the child found the third pail empty.

(2) Superiority and degradation. The experimenter, holding a watch in one hand and an egg in the other, dropped the watch in a sauce pan of boiling water.

(3) Incongruity and contrast. With a baby bonnet and top hat to choose from, the experimenter put on the bonnet and handed the child the top hat.

(4) Social smile as a stimulus. Experimenter tells child about something that happened and smiles.

(5) Relief from strain. In this case, completing walking along a chalk line.

(6) Play situation. In one, child spun a spinning varicolored top.

In a recent study (Wolfenstein, 1954) of children's humor, somewhat similar situations were found to furnish the basis of their jokes. Wolfenstein, therefore, concludes that children's jokes serve the purpose of transforming embarrassing, frustrating, or painful situations into mirth-provoking ones. Her thoughtful analysis also suggests that further study of children's joking might throw considerable light on the inner world of early childhood.

Responses to Pleasure, Encouragement, and "Affection"

Evidence has already been offered that pleasure leads to expansive motor activity (children threw too far after making a ringer in a ring toss test, Goodenough, 1929) and that encouragement helps to promote persistence and more effective accomplishment (children given encouragement to keep trying developed more constructive responses to failure, Keister, 1938; and children given encouraging suggestions tended to make better progress in mastering a motor skill than those given discouraging suggestions, McClure, 1936).

Evidence is also available that being deprived of affection adversely affects the behavior of infants and young children.

Studies (Goldfarb, 1943, 1944, Spitz, 1949) of the behavior of infants deprived in this respect are, as we shall note later, open to some question on the basis of selection of subjects. The evidence they offer, however, is sufficiently consistent to suggest that receiving "affection" plays a part in a child's development of relationship with adults, in his general happiness and well-being, and possibly in his performance on developmental test items. A study involving young rats (Hebb, 1947) similarly shows that those reared in a home setting with human attention performed better on certain learning situations than those kept in cages under laboratory conditions. While it is true that a home setting offers greater opportunities for learning, even for a rat, a slight but consistent relationship between human handling and superior T test performance in laboratory rats (Bernstein, 1952) suggests that at the infrahuman as well as the human level, receiving encouragement, interest, affection if you like, plays a part in optimal functioning.

It would of course also be of interest to know something of the processes underlying a young child's development of affection and friendliness. So little study has, however, been directed to this behavior that about all that can be said at present is that young children tend to give to others what they receive from them, and that their first objects of affection are those persons who minister to their comfort and feelings of security. Evidence will be presented in Chapter 12 that children who have to compete with another child for their mother's favors (Koch, 1955) show greater friendliness to a woman teacher; such facts emphasize the need for exploring further the attitudes and mechanisms underlying children's friendly behavior.

The various studies of children's emotional behavior challenge us to formulate the circumstances likely to lead to emotional well-being in early childhood. A few investigators have, therefore, attempted to

formulate the concomitants of emotional well-being by describing the characteristics of children who give many evidences of happiness and effective functioning.

The Bases of Emotional Well-Being in Early Childhood

In one such description, "Mary, the Ideal of Her Peers," Macfarlane (1942) describes the lot of a child who was unique in a group of over 200 children studied over a period of 20 years for her winning friendliness, winsome personality, and almost universal popularity. She was, for instance, described by her teachers as "radiant, a lovely little girl, a delightful child and a privilege to teach." In the third grade, one third of her classmates chose her in a sociometric test as their best friend.

What were the circumstances of Mary's life? Briefly, she was so well endowed physically and mentally and so psychologically "privileged" in the kind of treatment she received that she would have been a most ungrateful sort had she not reflected the sunny atmosphere in which she was reared. To be specific, Mary was a term baby; she was breast fed; she had a bland health history unmarred by serious illness or even slight sensory defect. She was better looking than average, had good motor coordination, an Intelligence Quotient which ranged from 137–157, and some talent in writing and drawing. As for her environmental circumstances, Mary was a second child who arrived at a stage in her parents' marriage when they had adjusted personality differences, and had learned something of child behavior from experience with their older son. Further, no younger sibling arrived to upset the family pattern of interrelationships, and as both parents expected little from a girl save being nice or good, there was no parental pressure to excel. Mary's physical environment was also stable. From the age of two years to adulthood she lived in the same house, in a neighborhood of small family-owned cottages. Some of her friends she had literally known all her life.

As the combination of circumstances contributing to Mary's success saga is somewhat unique and would, at that, not be to everyone's taste, a question naturally arises as to what can be done to promote the emotional well-being of all children in our society. This will therefore be considered in a later chapter on the significance of environmental factors in human behavior.

Review

The emotional behavior of the young child is difficult to study, partly because it is manifested in different ways—in overt behavior, in physiological reactions, and in subjective feelings—but mostly because we cannot explain emotions without implying the existence of motivations, and we have at present no acceptable theory of human motivations and behavior mechanisms.

The development of some specific identifiable patterns of emotional behavior can be explained in terms of the maturing of a native or inborn response. But characteristic *individual* patterns of internalizing or externalizing emotional responses to specific situations appear, in contrast, to result from learning.

Among specific overt patterns of emotional behavior studied, fear and anger show changes with age in their source and expression. Though generalized feelings of anxiety and hostility have been less intensively studied than fear and anger episodes, there is evidence in children's fantasies that both are widespread. There is, however, a lack of consistent confirming evidence of the existence of some of the universal fears postulated by Freudian psychoanalysts as the bases of adult neuroses.

Jealousy appears to have its roots in the character of the parent-child relationships. The child who for any of a number of reasons feels insecure concerning his parents' affections is more likely to become jealous.

Young children's responses to failure and frustration reveal a lower tolerance for frustration than that of older children and adults. Hence it may be assumed their emotional well-being is to a larger extent dependent on consistency of routine, familiarity of surroundings, and ability to predict outcomes.

The development of the pleasant emotions has so far received so little study that about all that can be said is that personal interest, attention, and affection appear to play a dominant role in the young child's normal development, and that the child's earliest objects of affection are those persons who minister to his needs.

Recommended Reading

The following is a condensed report in *Psychological Studies of Human Development*, edited by Raymond G. Kuhlen and George G. Thompson

(New York: Appleton-Century-Crofts, 1952): pp. 382–90, Sewall, Mabel, "Some causes of jealousy in young children" (A report on the home circumstances of 70 jealous children, which suggests a relationship between jealousy and the number of children in a family, the disciplinary methods used by parents, and the method of preparing a child for a new baby.).

See also these reports in *Readings in Child Psychology*, edited by Wayne Dennis (New York: Prentice-Hall, 1951): pp. 414–21, Goodenough, Florence, "Anger in young children" (A report on a naturalistic study of the home situations in which children become angry and exhibit fits of temper, of how anger is handled by the parents, and of the frequency and duration of temper outbursts.); pp. 421–6, Jersild, Arthur T., "Children's fears" (A summary of several studies on young children's fears, and on the changes with age in the situation causing fear, and of methods used in overcoming fears.); pp. 382–92, Sherman, Mandel, "The interpretation of emotional responses in infants" (A study showing how difficult it is for observers to know what is causing infants to perceive as they do. Observers who *thought* they were observing infants' behavior were shown to be judging infant response in terms of the stimuli that produced them.).

Recommended Films

"Frustration play techniques." Sound, 40 mins.
New York University Film Library

"Angry boy." Sound, 30 mins.
International Film Bureau, Inc.

"A two-year-old goes to the hospital." Sound, 50 mins.
New York University Film Library

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Chapter 7

SOCIAL BEHAVIOR TOWARD AGE PEERS

What are the earliest forms of social behavior?

What circumstances are likely to promote socially integrative behavior in young children?

What circumstances are likely to promote conflicts and quarrels in young children?

Are children of tender years tender-hearted?

Do young children make judgments on and assign roles to their age peers?

How does a young child perceive himself?

How do young children perceive parental roles?

THE YOUNG child is a social creature. His dependence on other human beings for care and comfort centers his interest in them. Even in early infancy he shows this interest by looking and smiling at his attendants, by babbling to get their attention, by crying when they leave him and smiling when they reappear. From such simple beginnings an infant progresses to distinguishing between familiar and unfamiliar persons and friendly and unfriendly approaches. Later he learns to distinguish other social characteristics of the individuals in his environment and begins to develop simple notions of the contrast-

ing social roles of children and adults, men and women, fathers and mothers, and persons engaged in different occupations.

Along the way he learns too something about himself. He learns what is required of him in ways of behaving in our society and how he feels about these requirements. He learns also what other people—his parents, playmates, relatives, and neighbors—think about him. Out of such interaction with the persons in his environment he develops whatever ideas he has of himself as a unique individual as well as a member of a social group.

In the process of interacting, he likewise develops and experiments with a variety of ways of behaving. These reflect his drives and desires, his level of development and ability to communicate, as well as the influence of the socializing process under gone by all children in all societies.

Are there discernible stages in these social developmental processes and do we know what contributes to them; what for instance makes a stoutly resistant two-year-old develop into a cooperative agreeable kindergarten child?

The Beginnings of Social Behavior

Crying and Mass Activity

The earliest behavior that can be considered in *any sense* social is crying and mass activity. It is social in that it calls forth a response by others. But, as the social response is made by adults who do not always know why infants are crying, such behavior represents a pretty limited form of social communication.

From the infant's standpoint, we can only conjecture that after a certain amount of experience of having his cries followed by attention, he perceives crying in some dim way as a means of improving an undesirable state of affairs. It seems unlikely though that the child can perceive the agent of change as having a distinctive social quality. Crying and mass activity must therefore be regarded as the *precursors and primitive source* of later effective social communication.

Smiling in Response to Human Face

Another early form of social behavior is the infant's smile when a human being bends over him or comes within his line of vi-

sion. The first "social" smile appears so regularly at around two months of age that it is used as a test item of behavior in infant developmental schedules (Gesell, 1928).

What is the infant smiling at?

One investigator (Spitz, 1946), attempting to determine what quality in the human face evoked smiling, confronted infants between 2 and 6 months of age with

a smiling human face (front and profile presentation)

a grimacing human face

a masked human face with a tongue moving in and out the mouth slit

a nodding puppet head

From the smiling responses of the infants (Figure 62), the investigator concluded that infants between 2 and 6 months of age were smiling to a configuration of eyes, nose, mouth in front presentation with some movement around the mouth.

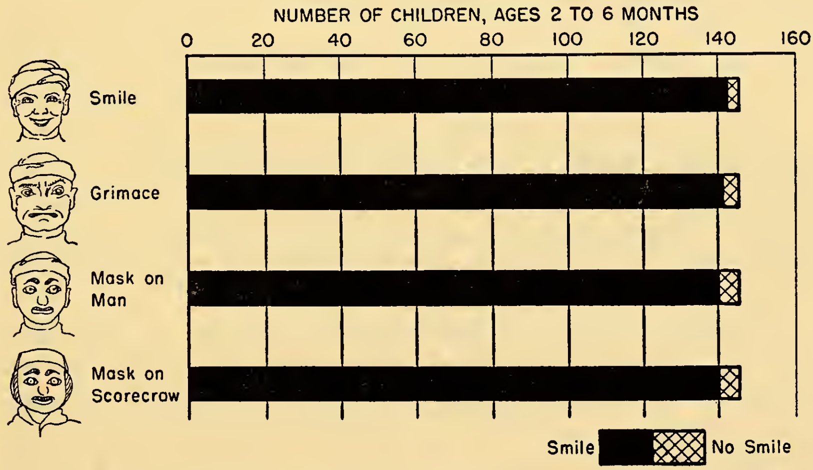

Figure 62. Smiling responses of 145 infants between two and six months of age to a smiling face, a grimacing face, a nodding masked head, and a nodding puppet head of human size. Drawn from data in R. A. Spitz, "The Smiling Response," *Genet. Psychol. Monogr.*, 1946, *34*, 57–125.

Why were they smiling? Presumably because they were able to bring into focus a configuration associated with comforting attention. It is tempting therefore to conjecture what the outcome in smiling behavior would be if adults attending infants wore a mask of a horse's head for the first three months of the infant's life. The evidence

certainly seems pretty clear that the infant's first smiles are not in response to human smiles. In one study, in fact, in which two adults attending a pair of twin girls never smiled or spoke to their young charges (Dennis, 1938) during the first two months of their life, it was found that the girls began to smile at their glum attendants at about the same age as infants with socially ingratiating, smiling, chirping, and nodding parents.

Therefore, the first smiles of infancy, evoked by persons, are, like crying and mass activity, only in a limited sense social behavior. Not until infants begin to distinguish between different persons and different kinds of social approaches does social behavior of an interpretive discriminative sort take recognizable form.

Discrimination between Familiar and Strange Persons, Friendly and Unfriendly Approaches

This discriminative behavior is first evident in infant's crying or shrinking from strange persons. As with smiling behavior at two months, this shrinking or sobering in the presence of strange adults at about six months of age is so universally observed that it is also a test item in infant developmental schedules (Gesell, 1928).

What the infant is shrinking from and why he is shrinking is, as with smiling, a matter of conjecture. A reasonable supposition is that a familiar person, form, configuration, or pattern of stimuli has become associated with comfort and care. An unfamiliar one *may* therefore appear like a loss of or threat to the continuance of the care on which the young infant is so dependent.

Whatever the basis of shrinking and sobering, the evidence it offers of distinguishing between familiar and unfamiliar persons and friendly and unfriendly approaches represents an impressive development in perception of form or configuration and in the ability to remember and associate sensory impressions. Such developing abilities change the character of the child's social environment. As the characteristics to which he is able to respond increase, the quality of his social environment obviously becomes more important. This of course does not mean that it has been unimportant during the first six months. Undoubtedly the child learns during this period to expect either help or frustration, either consistency or inconsistency in the satisfying of his biological needs for food, warmth, rest, and activity. Social development during the second six months of life is thus not a sharply defined stage. Rather it is a progressive expansion and development of

responses and perceptions as a result of maturing abilities and increasing experience.

During the years which follow, the child's social development continues to reflect his interaction with his social environment. In this interaction the major element is the child's relationship with his parents. As this relationship is largely the result of parental attitudes and behaviors, it would not be particularly meaningful to consider it from the standpoint of the variety of behaviors—dependence, negativism, friendliness, disobedience, and such—that children exhibit to parents and other adults.

Parent-child interaction is therefore reserved for consideration as one of the major environmental factors in the development of personality in Chapter 12.

As the young child's relationships with his siblings are inseparable from those with his parents, they too will be considered later. This leaves us then with the child's relationships with his age peers.

Young Children's Behavior Toward Each Other

Interactions during Infancy

A few studies of infant interaction suggest that what happens when two babies are put together depends on their respective ages and fighting weights. During the first six months of life, there is little recorded evidence of babies showing much interest in each other when placed in the same pen. This is probably due to their being handicapped in coming to any kind of social grips with each other by their immobility, inability to maintain an upright position, and poor manual coordination. In the second half of their first year of life, they progress to cooing and lalling to get each others attention and to offering toys and taking them from each other. In such interaction the older and stronger infant is reported (Maudry, 1939) to be the dominant one.

Observations of infant interaction have, however, been made under rather restricted laboratory conditions. What one would like to know is how social interaction develops between like and cross sex twins who spend the major part of the day in each other's company. Is it true, as some mothers report, that infant twins to some extent "help" in the care of each other, and if so, how does this affect their relationship with their mother and with each other?

Though little systematic study has been made of interaction between infants and young family members in their homes, there is no dearth of recorded observation on such behavior in nursery school children. This has resulted partly from the availability of nursery school children and partly from the need of nursery school teachers to know something about young children's social behavior in order to guide it effectively. Most studies of young children's social interaction are therefore relatively unconcerned with behavior theories. The questions to which they seek answers are simple and practical ones concerning the kinds of behavior one can expect of boys and girls of different ages in standard play situations, the ways in which children's behavior in nursery school is related to their home experiences, and the ways in which undesirable behavior can be modified.

As anyone who has ever watched a group of young children knows, they vary in the extent to which they have anything to do with each other.

Developmental Levels in Group Participation

Variations in the social participation of young children have been studied by recording for each child the frequency of behavior representing different degrees of social involvement. Such be-

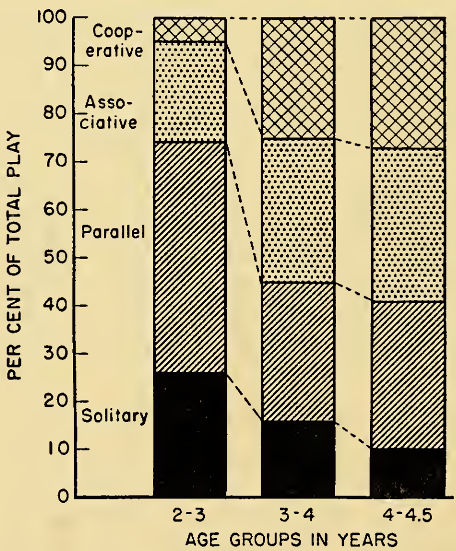

Figure 63. Types of social participation in nursery school children. From D. Krech and R. S. Crutchfield, *Elements of Psychology.* Copyright 1958 by David Krech and Richard S. Crutchfield. New York: Alfred A. Knopf, Inc. (Based on data from Parten.)

havior has been classified as (1) unoccupied play, (2) solitary play, (3) onlooker, (4) parallel, (5) associative, and (6) cooperative play. Using these categories an investigator (Parten, 1933) observed each of 42 two- to five-year-old nursery school children for one minute a day for a number of days. In this way a "time sample" of the behavior of each child was obtained.

As Figure 63 shows, there was a progression with age from onlooker and parallel activities to interactive group play. This relationship between age and social participation was also demonstrated by computing social participation scores for the children. This was done by assigning values of -3 to $+3$ for the different degrees of involvement and multiplying the number of 15-second intervals in which a type of behavior occurred by its assigned value. As a result a correlation of .61 was obtained between social participation and chronological age.

As part of this study (Parten, 1934), children were also rated for each 15-second interval on a five-point scale on the leadership they exercised in the group. As the correlations below show:

leadership and social participation	$r = .97$
leadership and age	$r = .67$
leadership and height	$r = .67$
leadership and IQ	$r = .34$

children's ability to interact with and lead others is partly a matter of their age and height. Their age and height are in turn associated with their maturity and also with their length of attendance at nursery school and hence acquaintance with the nursery school children.

Acquaintanceship obviously affects social relationships at all ages. It is a rare person who goes up and slaps other people on the back at a social gathering without previous acquaintance. However, that maturity also plays a part in young children's group participation is borne out in other studies. In one (Green, 1933a,b), it was revealed that the number of children a child interacts with in group play increases with age, apparently because maintaining an associative relationship with more than one person requires effective use of language.

Children vary not only in their degree of involvement with a group, but also in *the ways* they interact with each other.

Social Interaction in Nursery School Free Play

In a pilot study (Sibley, 1945) of the interaction of 16 three-year-olds in a university nursery school, the first social contact

in a five-minute period was recorded for each child during four half-hour periods. The contacts were classified in terms of their form (14 categories) and their reference content (13 categories) by independent observers (with 95 per cent agreement).

As Figure 64 shows, the children were mostly concerned with exchanging information. These observations, however, were made in a nursery school that had ample space, a variety of equipment suited to young children's activities, and adequate staff to give unobtrusive guidance. What happens when circumstances are less favorable?

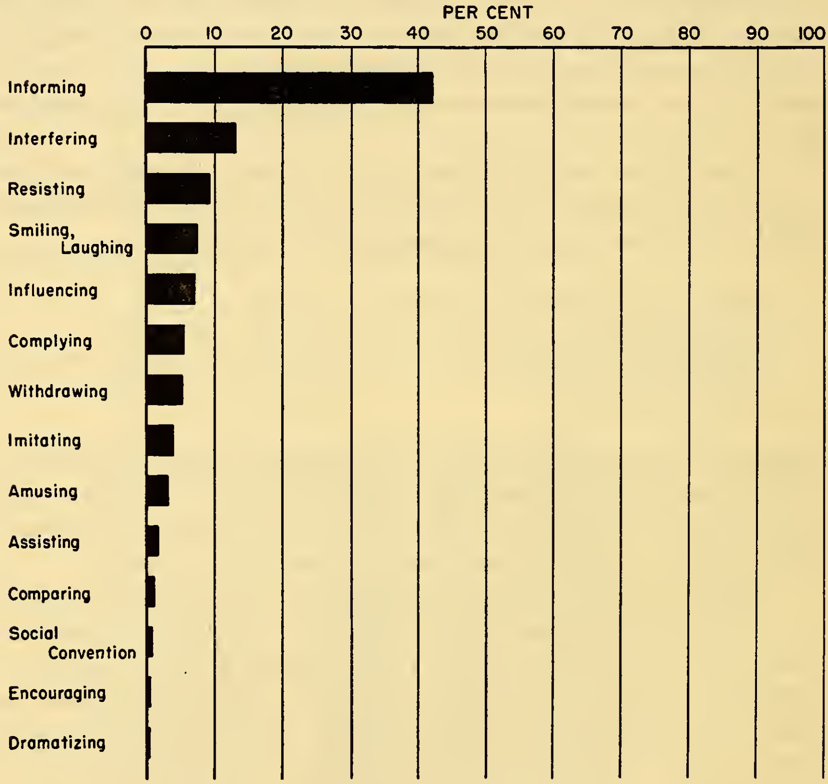

Figure 64. Classification of child-child contacts in a nursery school in terms of what appeared to be their function. From F. K. Sibley, *A Comparison of the Social Techniques of Younger and Older Nursery School Children.* Unpubl. M.S. Thesis, Univ. of California Library, 1955.

In a study, already discussed, children on a poorly equipped playground were found to indulge in much more aggressive and undesirable social behavior than they did when on a well-equipped playground. This suggests that all social behavior must be interpreted in terms

of the context or circumstances in which it occurs. Let us now see what some of these circumstances are.

Circumstances Associated with Socially Disruptive Behavior

Conflicts and Quarrels

Since about 1930, considerable to-do has been made over the aggressiveness of young children—a surprising state of affairs when one considers what adults have been doing during the same period on the international, national, local, and domestic fronts. Several studies are therefore reported of nursery school children's quarrels and conflicts (Green, 1933a,b, Dawe, 1934). These reveal that most quarrels are over possessions, that boys quarrel more than girls, and that children engage in fewer quarrels as they get older but the quarrels last longer. Some nursery school activities are found to be more contentious than others, mainly those that are less adult-directed and more likely to lead to friction over use of equipment. Thus in one school the sandbox was the scene of many conflicts, possibly because it provided a ready supply of fighting ammunition and became, unless well supervised, overstocked with children and understocked with coveted spoons, sieves, and other sand equipment.

Evidence that *sweat and tears* and an occasional drop of blood *are normal accompaniments to the social interaction of young children* is offered in a comparison of their friendship and quarrel in-

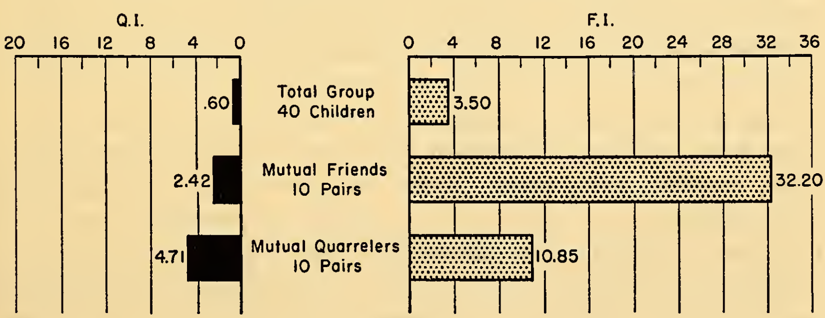

Figure 65. Friendship and quarrelsomeness indices of a group of nursery school children and of ten pairs of mutual friends and mutual quarrelers in the group. Drawn from data in E. H. Green, "Friendships and Quarrels Among Preschool Children," *Child Develpm.*, 1933, *4*, 237–252.

dices (Green, 1933a). These indices are proportions of the time spent with others in which interchange is amicable or quarrelsome. As Figure 65 shows, mutual friends had more quarrels than casual companions. Quarrelers also tended to spend more time in "friendly" play. A few fights then—until better methods of solving property problems have been learned—seem a small price for a child to pay for the rewards of human companionship. Incidentally, it was also found that nursery school conflicts were mostly solved without adult aid and lasted, on the average, only 30 seconds, an infinitesimal fraction of time compared with the duration of organized strife in adult life.

Ascendant Behavior

A somewhat different approach to the interpersonal struggle for power among children is reflected in a series of studies from the University of Iowa. In all of these, children were rated on the assertive quality of their social interaction in a nursery school and then observed in several pairings with different children in a standard play situation. In two such studies (Jack, 1934, Page, 1936), the behavior analyzed was termed ascendant or getting one's own way by fair means or foul in play with a child partner.

In five five-minute play sessions, children were scored on the frequency of such behavior as (1) verbally attempts to secure play materials, (2) forcefully attempts to secure play materials, (3) succeeds in securing them, (4) defends, snatches back, (5) verbally attempts to direct behavior of companion, (6) companion complies with suggestion, (7) forbids, criticizes, reproves companion, (8) provides pattern which companion imitates. Five children with the least ascendant scores were then given a training period designed to produce a little more self-assertion. Specifically, the children were given training in skills that presumably contribute to juvenile social confidence, such as making a mosaic design, completing a puzzle, and learning a story. They were, of course, incidentally given the experimenter's encouragement, interest, and support. When re-paired with some ascendant children after this treatment, the previously non-ascendant now held their own, indicating that non-ascendant social behavior is modifiable, a fact that all advertisements of the "I was a wallflower until I learned the tuba" type have long been impressing on the public. How permanent or extensive these gains in self-assurance were is not reported, though it would seem likely that they would have little enduring effect unless lack of skill had been the basis of the child's lack of self confidence.

Dominative and Integrative Behavior

In thoughtful extension of these two studies, another investigator (Anderson, 1937) defined socially interactive behavior in terms that distinguish between fair and foul means of influencing others. This classification has, therefore, a more meaningful relationship to our system of social values. A socially disruptive and uncooperative form of behavior termed *domination* was defined as "expending energy against rather than with people, disregarding ideas of others, resisting differences and changes and behaving in a rigid inflexible way." Behavior which led to "finding a common purpose" with another, making a change in goals as a result of meeting a person different from himself, and behaving in a flexible, spontaneous, dynamic way was termed *integration.*

In a follow-up series of studies (H. H. Anderson, 1939), dominative and integrative scores were obtained on children in nursery school and kindergarten groups and in standard play sessions. Scores were also obtained for the dominative and integrative behavior of the children's teachers. An interesting finding from these studies, though perhaps not a revolutionary one, is that dominative behavior on the part of one child leads to domination on the part of his or her partner, integrative behavior leads to integrative responses. Similarly children in classrooms of teachers with high dominative scores had higher scores in this behavior than those with more "integrative" teachers. (The part parental behavior models and parental practices play in young children's dominative behavior will be considered in Chapter 13.)

As all interpersonal struggles for power involve an element of competition, one would like to know when competitive behavior develops in early childhood, what causes it and what forms its expression takes.

Competition

At present, laboratory studies offer somewhat limited information on the dynamics of this behavior. In one such study (Greenberg, 1932, 65 children, 2–7 years), children were taken in pairs into a playroom and invited to build with blocks. After they had finished they were asked "which is prettier?" They were then invited to see who could "build prettier." Behavior scored as competitive was grabbing blocks, speaking favorably of own work and disparag-

ingly of that of the other child. Under these conditions no competition was found in the two-year-old group. Forty-two per cent of the three-year-olds showed some competition and 86 per cent of the six-year-olds.

In another study (McKee, 1955) in which 112 three- and four-year-old children were paired in a block-building play situation, evidence is offered that children's competitive behavior is related to their parents' occupation as well as to the children's age. Thus, children whose parents were engaged in professions showed significantly less competition than those whose parents were engaged in relatively unskilled occupations. There was also more competitive behavior in boys than girls. On the basis of this evidence, the investigators suggest that competition and aggression may undergo different training processes in children in different socioeconomic circumstances. What is also possible is that a situation may be competitive for children who have had little opportunity to play with blocks, but may offer no challenge to those who are sated with block experience.

Existing studies of competition are therefore somewhat misleading and inadequate because they were made under adult-contrived circumstances, and because they try to test a form of behavior that probably occurs only when young children are highly motivated. An invitation from an unknown adult to build something "prettier" than a child partner is probably not adequate motivation for a three-year-old, particularly as understanding of the term "prettier" is set at the four-year level in the Stanford Binet test items.

Consider in contrast the following family situations in which young children were motivated to compete.

> A three-year-old Mary in a university nursery school had a baby sister who was much admired and made over because of her magazine cover beauty and head of blonde ringlets. Mary's hair was straight and tow colored and she was the sturdy, rather than the pretty type. In the face of adult comments about her young sister's beauty, Mary sometimes volunteered that she knew a song. Unfortunately she was seldom asked to sing. One night, however, she took matters into her own hands. While her mother was out at a party, Mary got the manicure scissors and gave her sister a close haircut. If this was not competition, it at least removed a competitor from business.
>
> Similarly at a dinner table one night a family group forgot the youngest four-year-old member in a heated political discussion. No one noticed he had slipped below the table until he began tickling their ankles. Unable to compete above the board, the boy resorted to below board tactics.

Let us consider now the behavior in which the child seeks to help and encourage others, to sympathize with them, and put himself in their place.

Circumstances Associated with Socially Integrative, Sympathetic Behavior

All studies and observations indicate that such behavior develops slowly and is the result of an effective socializing process. The young child left to his own devices would probably operate on a law-of-the-jungle basis. In this he is not immoral, he is amoral. He is concerned with self-preservation, and with satisfying his basic needs or drives for food, rest, activity, and love. If he does not take other people's wishes and rights into consideration, it is largely because he does not understand they have them. That it is hard for him to put himself in another's role and to view behavior in terms of its effect on different individuals has been interestingly demonstrated in a study (Strauss, 1954) of children's understanding of monetary transactions. Here, it was found that a major difficulty in children's understanding of the profit element in sales transactions was their inability to put themselves in the place of another person, and in particular to view a sale in terms of the various people concerned by sliding from one person's role to another.

Children not only have difficulty in putting themselves in another's role, they also are often unable to perceive how others feel. In a study (Gates, 1923), in which children 3 to 11 years of age were shown an actress portraying different emotions and asked what she felt, the age at which half the children were able to identify a particular emotion was as follows:

laughter	3 years
pain	6 years
anger	7 years
fear	10 years
surprise	11 years
scorn	12 years

In this situation, of course, the children were judging emotion portrayed by an unknown person in a photograph and were expressing their judgment in words. What of other situations in which empathy or sympathy might be evoked?

Sympathy

In a study (Murphy, 1937) in which children were shown pictures and told stories concerning people in trying circumstances,

it was found that children under three years were unmoved by black-and-blue wounds, and by pictures of funerals and cripples.

The results of systematic study of this sort are supported by incidental observation of young children's behavior to small animals which they abuse with happy and savage innocence.

> Recently in a nursery school a police dog entered the yard where the children's pet rabbit was nibbling the grass. The teacher rushed to the scene. Anxious to spare the rabbit and children an unpleasant experience, she quickly got the dog outside the gate. Immediately the boys gathered angrily around her. "We wanted to see what the dog would do to the rabbit" they complained. Looking into their faces, the teacher realized that had the dog turned on her, at least some of them would have watched the outcome with objective detachment.

This lack of ability to put themselves in the place of others also accounts for the lack of encouragement given by children to each other. Compare the percentage of contacts in which teachers and children offered encouragement in a nursery school setting (Figure 66).

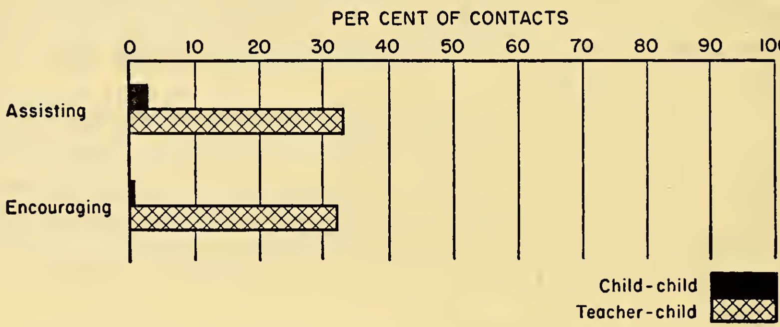

Figure 66. Percentage of teacher-child and child-child contacts in which encouragement was given. University of California Nursery School. Redrawn from F. K. Sibley, *A Comparison of the Social Techniques of Younger and Older Nursery School Children.* Unpubl. M.S. Thesis, Univ. of California Library, 1955.

As some understanding and acceptance of others' feelings and interests is an essential element in sharing and playing together, let us now consider how cooperative behavior develops in early childhood.

Cooperative integrative behavior

In a study (Chittenden, 1942) in which children were rated on the basis of their dominative behavior in a nursery school, some of the most dominative were put through a training period of several short sessions in which they played with two puppets. The play fol-

lowed a sequence in which a child was first confronted with a situation in which both puppets wanted a toy and neither would make or accept any compromise. The experimenter and child agreed that now neither puppet could play or have any fun. In the second situation, the two puppets again both wanted the same toy, but this time the experimenter pointed out that they could take turns and both continue to have fun together. In the third session the child was confronted by the same situation of two puppets each wanting the same toy and asked what he thought they could do. His response in this test situation and his later behavior in the yard both indicated that he had profited from the demonstration in making and accepting compromises and working out a solution that suited both parties.

It is unlikely of course that a few play sessions would have a permanent effect on children's social techniques. This experiment demonstrates however that children can learn to play cooperatively; the implication is not to coach them in occasional puppet situations, but to give them frequent help and guidance in the play situations in which they are behaving. Later we will consider how this may be done.

But before doing this, studies of the attitudes that underlie children's behavior toward each other should be considered.

Children's Attitudes Toward Each Other

Role Assignment

In a recent study (Sidwell, 1953), an attempt was made to determine whether four-year-olds make judgments on and assign roles to each other and whether these judgments are the same as those made by adults. The children in this investigation were invited to join a "tea party" for two with the experimenter. While each child was pouring cider into his cup, he was asked if he could guess what the experimenter was thinking about—"something with four legs and a tail and a loud bark." After some warming up guesses of this sort, the child was told that the experimenter was thinking about someone in the nursery school. The someone was described as being a good or poor climber, a skillful or unskillful user of wheel toys, a gregarious or solitary child, a popular or unpopular child, a gay, happy child or one who doesn't seem to have much fun, someone who takes turns or who grabs and won't take turns, someone who hits and pokes or who never does, and someone with many or few ideas for things to do.

The kinds of behavior included above were selected as ones that children would be interested in and impressed by. After repeating the tea party on another day, the child was asked who were his friends. Teachers also rated all the nursery school children and parents rated their own child on the kinds of behavior the children ascribed to each other.

Children's ready responses made it clear that they do indeed ascribe roles to each other of being a good or poor climber, a hitter and grabber or a taker of turns or someone who can think of lots of things to do, etc. Further they concurred fairly well in their judgments, showing that nursery school children are subject to some measure of group opinion. The kinds of behavior on which they agreed best were the most concrete and specific ones like taking turns and hitting and pushing. (On these behaviors correlations between halves of the judges were respectively .84 and .79).

Sex Roles

Average scores assigned boys and girls on the 16 kinds of behavior showed that five-year-olds share the generally accepted notions of girls' and boys' behavior. As Figure 67 indicates, boys were

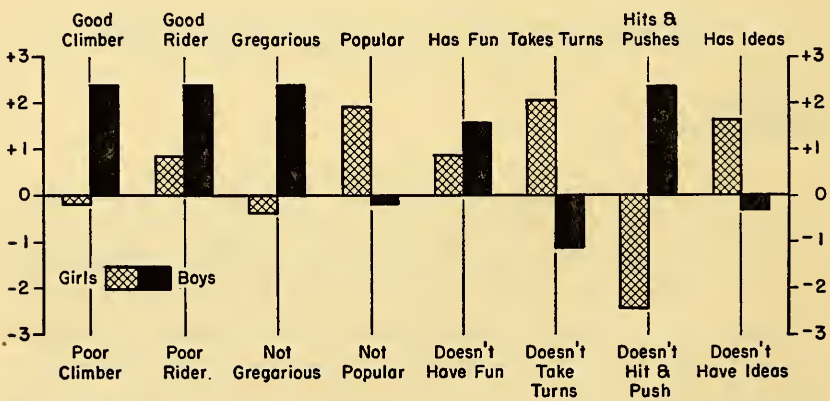

Figure 67. Behavior scores assigned four-year-old girls and boys in a "guess who" test by their age peers. From D. M. Sidwell, *Ratings of the Behavior of Four-Year-Olds by Children of the Same Age, Nursery School Teachers and Parents.* Unpubl. M.S. Thesis, Univ. of California Library, 1953.

thought of as being more athletic and aggressive, girls as more popular and using better social techniques. In other studies (Conn, 1951, Rabban, 1950), in which children were questioned concerning ap-

propriate behavior and playthings for boys and girls, similar attitudes were found.

There is also evidence that even in early childhood the masculine role is considered more desirable than the feminine one. To illustrate, in one study (Brown, 1956), 68 boys and 68 girls aged 5.4 to 6.4 were shown a card depicting a sexually undifferentiated child figure. At the same time they were shown line drawings of a girl, a boy, a boyish looking girl and a girlish looking boy and asked which "it" (the sexually undifferentiated child figure) would like to be. Children were then asked to choose from a series of 16 cards depicting masculine or feminine activities which "it" would like to do. They were also shown a series of 16 cards depicting objects associated with the masculine role such as a shaving kit and those with a feminine role such as a cosmetic case and asked which "it" would like. The children's choices showed that only one boy in ten chose an opposite sex (girl) role, while one girl in three chose a boy's role for "it." Further, while boys and girls both showed mixed preferences of activities and objects, boys' preference for masculine ones was much greater than girls' for feminine ones.

Friends' Roles

Friends in Sidwell's study were described in terms of good behavior. This is in line with studies of popularity in young children which show (Koch, 1933) that the popular child rates high in such characteristics as respect for other children's property rights, and social compliance.

Interestingly enough, and in contrast to an earlier study (Koch, 1933), children's and adults' judgments in Sidwell's study were not in high agreement, a fact that may be due to adults and children interpreting differently "someone whom the children always want to play with." For example, the child rated most popular by the nursery school teachers was mentioned only twice by the children as a friend, and the correlations between children's and teachers' judgments of "popularity" was −.07. The implication here is obvious. If you want to find out how a young child's age peers feel about him, ask the peers.

A major factor in a child's choice of playmate, when there is a choice, is the playmate's sex. This is indicated both in the percentage of time children spend with playmates of their own sex and the other sex and in their choices of a playmate in test situations (Helgerson, 1943).

Ethnic Roles

How do young children feel about playmates with different skin color from their own? Though there has been no systematic study of actual behavior of young children, their attitudes have been explored by asking them which child in each of a series of pairs of photographs they would like to play with (Helgerson, 1943, 303 white and Negro nursery school and kindergarten children with different social and economic family backgrounds). The series included a laughing and a sober white boy and white girl and colored boy and colored girl. The pairs of photographs were presented in such a way that comparisons were possible of children's sex, race, and facial-expression preferences. As a result it was found that sex was the most important factor in choice of a playmate, race was next, and facial expression was of little significance. Preference for a playmate of the same race increased with age among both white and Negro children; children's remarks suggested that their preference reflected parental attitudes.

In another study (Landreth, 1953, 288 three- and five-year-old white and Negro children in California), designed to compare attitudes to skin color of children of parents engaged in professions and in comparatively unskilled occupations, the children were invited to complete a series of pictures with one of a pair of insets. Each picture had three insets alike in all respects save skin color (see Figure 68). Therefore the three pairings were of a white-skinned inset figure with a brown-skinned one, a white with black, and a brown with black.

Though children's behavior in a picture-test situation may not be quite the same as it would be in a real-life situation, the children's choices of insets and their spontaneous remarks *suggested* that what a child thinks about other children's skin color depends on the particular subgroup of our society to which he belongs. Thus children of parents engaged in professions showed no significant differences between their choices of white, brown, and black-skinned inset figures. Those whose parents were engaged in unskilled activities chose a white-skinned inset figure significantly more often than a dark-skinned one, and this was true to an even greater extent of the Negro children. From this study it seems clear that by the age of three, the meaning of skin color for children depends on their experience. If children grow up in a social group which competes with dark-skinned people for housing and work opportunities, they tend to learn that white skins are superior, dark ones inferior. Similarly, as we shall see later, if

Figure 68. Two pictures and insets used in a projective test designed to reveal young children's responses to persons of different skin color. From C. Landreth and B. C. Johnson, "Young Children's Responses to a Picture and Inset Test Designed to Reveal Reactions to Persons of Different Skin Color," *Child Develpm.*, 1953, *24*, 63–79.

children are members of a dark-skinned group that is discriminated against, they learn to wish to be white.

Additional evidence concerning the attitudes of children in relatively unskilled occupational groups is offered in the clothing and housing these children assign to Negroes and whites. In one study (Radke, 1950) kindergarten children were given good and poor house models and good and poor outer clothes from which they could choose the appropriate one for Negroes and whites. Though both ethnic groups tended to put the doll representing their own group in the better clothes, poor housing was more often chosen by both for the Negroes.

The part parents play in children's development of such attitudes is indicated in another study (Radke-Yarrow, 1952), in which parents of first and second grade children found to be hostile to Negroes were revealed to be hostile themselves. Further they appeared to have no feeling of responsibility for the social attitudes the children were developing.

In summary, by the age of four years children pass judgment on and assign roles to each other. Though their judgments are not always in agreement with those of parents and teachers, they tend to reflect the judgments of the social and economic subgroup to which the children belong. Hence parents and teachers have a responsibility to examine critically the social values they are transmitting. Further, a child's relationship to a group of his peers is perceived somewhat differently by his peers and his parents and teachers. Parents and teachers wishing to help a child in his group relationships would therefore be wise to take peer judgments into consideration. A child whom no one wants to play with or mentions as a friend is not helped much by his parents taking for granted that he is popular or assuming that child judgments are uninformed and unimportant anyway.

This brings us then to a consideration of the ways in which parents and teachers can help young children get along with each other.

Circumstances Favoring Development of Positive Relationships with Other Children

Pleasant First Experiences

As studies of conflicts between mutual friends suggest, getting along with other children involves a certain amount of wear and tear. Obviously this wear and tear will hardly seem worth-while

unless a child enjoys being with other children. Therefore, his first experiences should be pleasant. Making them pleasant is largely a matter of keeping them short, simple, and supervised. For a two-year-old, an occasional half hour or hour with a child his own age and fighting weight is a better introduction to social life with his age peers than the free-for-all of a large birthday party.

Equipment Suitable for Social Play

As young children spend a large part of their time manipulating things of some sort, whenever they are brought together they need duplicates of simple things to play with, such as blocks, boxes, balls, and rubber trucks. One tricycle, one doll carriage, or one wagon is likely to lead to conflict, and no playthings at all may result in children using each other as expendible equipment. In families it is, therefore, helpful to have some play equipment all members can enjoy using together such as a sandbox or climbing apparatus or bubble-blowing outfit, as well as some that is clearly the property of individual children.

Adult Understanding of Children's Social Developmental Level

Only limited interaction is possible between children who have limited command of language and limited ability in coordinating several activities. Therefore, it is wise to let them proceed at their own pace, perhaps merely looking at or playing independently alongside each other. When they are capable of initiating more complex interaction, they will take the lead themselves.

Adult Interpretation of One Child's Behavior to Another

As studies of sympathy indicate, young children learn slowly that others have feelings like their own. They are, therefore, helped by occasional interpretations of others' behavior. When a six-year-old slaps a two-year-old brother for interfering with his block building, the older child will profit from being reminded that the younger one only wanted to play with him and could have been told to build something of his own nearby. Similarly, the two-year-old will be helped by being told that his brother wants to build by himself, but that *he* can do something too nearby.

In similar vein, children profit from adult help in examining the bases of their attitudes to others. How can such help be given? As one illustration, in the University of California Nursery School, the four-year-olds take their mid-afternoon rest in small groups of six, with the head teacher sitting quietly in their midst. At this time it is the accepted custom for children to speak freely of whatever is on their mind. Often it is the behavior of a child or adult. Some one says "Jim [not present] is a bad boy. We don't like him, do we? And we're not going to play with him." Quietly the teacher asks why don't they want to play with him, and after accepting their feelings about Jim's behavior, may point out extenuating circumstances or remind them of Jim's better moments and more welcome contributions to group play. Teacher and children may even explore ways in which Jim may be "helped." Even if there is no such therapeutic outcome, children and teacher become a little clearer as to the bases of their attitudes.

Adult Suggestion of Acceptable Social Approaches

Studies of the social interaction of young children make it clear that some social approaches work, others don't. Young children need to learn that a whining "Can't I play with you" or "Let me play" is pretty sure to meet with refusal. Making a contribution of some sort: an offer of "I could help push," or "I could be the milkman," or even a little interest, "What are you doing? You're making a road, aren't you?" is more likely to lead to being included in an enterprise. Once children grasp the general principle that they must contribute something in order to be accepted, they may become extremely adriot in relating their contributions to the activity they are interested in joining.

> In a nursery school two girls were playing lions in an abandoned aviary. A third girl ran over to join them. "Go away," roared the lions, kicking the door shut in her face. The third girl stood her ground, "You lions are hungry" she said. "I will feed you." She got some blades of grass and poked them through the netting at the ravening lions. Soon she was roaring in the cage while the late lions were out hunting grass for her.
>
> Sometimes the nature of the contribution is a surprising one. Milly, a timid three-year-old came to school handicapped by a poor physical constitution and the inconvenience of glasses worn to correct a strabismus. Despite teacher efforts to include Milly in children's activities, she was largely ignored and played alone. Judge of the teacher's pleasure and surprise when she saw Bill, the most sought after boy in the group, looking raptly into Milly's face with a smile on his lips as they both stood in a patch of sunlight. After a moment of silence, he said to her

with obvious pleasure, "I can see myself in your glasses." Though an extraordinary remark for a boy of any age to use in ingratiating himself with a girl of any age, its basis was clear. Milly had offered the uniquely feminine contribution of a mirror for masculine vanity.

Often, undesirable activity can be forestalled by a timely and telling suggestion. Consider a nursery school teacher's foresightedness in the following situation.

Priscilla sat in the sandbox putting the finishing touches to a cake she had turned from a tin mold. As she patted it with domestic pride, two boys drew alongside. The teacher overheard them say "Let's bust it." She said to Priscilla, "You have company. Maybe they'd like a piece of your cake." As Priscilla offered her cake with a smile, the "busters" were completely disorganized by this unforeseen hospitality and turned from their projected destruction to cake and conversation.

The method of giving a suggestion as well as its content determines it social usefulness. When children's house play includes nursing a sick doll and a boy who wants to join the play is told to get out, it is clear to any adult that this is an occasion when there could be a doctor in the house. If the adult makes this suggestion herself to all the children concerned, what they are likely to learn is that in an impasse they look to an adult. If instead, a whispered suggestion is given the rejected boy and he uses it successfully, there is more chance that in another similar situation he will think of offering services suited to the occasion.

Social approaches adopted by children because they work and lead to good times for all are thus more meaningful and enduring than ones an adult tries to impose by sheer force of authority.

Adult Labelling or Approval of Acceptable Social Behavior

As acceptable social behavior is learned (and as evidence already offered [Pyles, 1932] suggests), verbalizing what is to be learned or paid attention to facilitates learning; children are helped by adult labelling and approval of acceptable social behavior. Thus, when a child helps a companion in distress, brushes him off after a fall and helps to right his wagon, or takes care not to run into other children when tricycling near them, a remark of "Fine, that helps Jim to feel better" or 'Nice driving" attaches credit where it belongs —to the behavior of the moment rather than to the child.

Adult Encouragement of Children's Skills and Interests That Contribute to Pleasurable Peer Interaction

Two studies already mentioned (Jack, 1934, Page, 1936) suggest that children take a more assertive role in group play when they have skills to contribute. Therefore, fostering a child's development of motor skills helps him to enter into the motor activities of his companions. Stimulating his use of language similarly helps him to communicate with them.

In his interaction with other children his own age, the child not only learns something about them, he also learns something about himself. What he learns is, however, not limited to his interactions with his age peers. Therefore, evolution of the child's selfhood, though reflected in all his social behavior, can be better considered in the context of the later chapter, "The Child's Interaction with His Environment."

Review

Social behavior develops in early infancy, manifesting itself in infants' selective interest in human faces and in their attempts to imitate and communicate with the adults who care for them. As infants develop the ability to distinguish between familiar and unfamiliar and friendly and unfriendly faces, the social characteristics of their environment become increasingly important.

Their interaction with their parents is probably the most important factor in their early social development, but as the nature of this interaction is largely dependent on parental behavior and attitudes, it is reserved for consideration as an environmental factor in the development of personality in Chapter 12. Hence, the present chapter is limited to social behavior with age peers.

In interacting with their age peers, children progress from an onlooker parallel type of activity to interactive play. The type of interaction they indulge in—disruptive or cooperative—depends in part on their development level (there are fewer conflicts and more expressions of sympathy in older children), in part on the adequacy of play equipment provided (there are more quarrels on poorly than well-equipped play-grounds), and in part on their teachers' and age peers' behavior (when teachers and peers are aggressively dominating, children also tend to be dominating).

As early as four years of age, children give evidence of passing

judgments on and assigning roles to each other. Their attitudes toward children of different sex and children with different skin color reflect the judgments and social values of the subgroup of society to which they belong.

As a result of interaction with their age peers, children learn something about themselves. They also learn something about themselves from other experiences.

Recommended Reading

The following are condensed reports in *Psychological Studies of Human Development*, edited by Raymond G. Kuhlen and George G. Thompson (New York: Appleton-Century-Crofts, 1952): pp. 387–95, Levy, David M., "Maternal overprotection" (A clinical study of 20 "overprotected" children with an analysis of their behavior characteristics and that of their "overprotecting" mothers.); pp. 402–9, Merrill, Barbara B., "Mother child interactions" (A study of mother-child interaction in a laboratory situation, which suggests that mothers differ widely in the extent to which they restrict or dominate their children's behavior, and that they become more directing and interfering when they believe their child's behavior is under criticism by another adult.); pp. 304–11, Radke-Yarrow, M. J., H. G. Trager, and H. Davis, "Social perceptions and attitudes of children" (A report on the attitudes to racial and religious groups of 250 kindergarten, first, and second grade children. Attitudes were determined by children's responses to a series of questions asked about pictures showing the lives and activities of members of different racial and religious groups.).

Recommended Films

"Preface to a life." Sound, 30 mins.
United World

"This is Robert" (Parts I and II). Sound, 80 mins.
New York University Film Library.

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Chapter **8**

PERCEPTUAL AND ADAPTIVE BEHAVIOR

How do young children arrive at notions of divisions of time?

What would seem a logical explanation of three-year-olds' reported insistence on things being in their "proper" place?

Which type of differentiation would you expect to develop first: absolute (big, small) or comparative (bigger, smaller)?

Why is it reasonable to assume that infants discriminate form to some extent during the first three months of life?

Which is easier for a young child: to count to four, or to tell you—without counting—which of 2 boxes has 4 marbles in it?

Can young children reason?

Adults bending admiringly over a young baby's crib and noting his contemplative gaze often remark rather fatuously that they wonder "what's going on in his little head." What is going on in any head can of course only be inferred from the owner's behavior.[1] It is, therefore, from the infant's and young child's actions and speech that we get some notion of his development of understanding. From both these sources we gather that the world of a young child is not that of an adult. Consider for example the following:

[1] An electroencephalogram, however, can furnish a record of the activity of nerve cells in different parts of the brain.

A mother of a five- and a nine-year-old daughter was spending a night alone with her children while her husband was out of town on a business trip. In the week before his departure there had been two burglar alarms in the neighborhood. These had not been mentioned in front of the children, and the mother was not unduly apprehensive until she was aroused from sleep by a noise in the dining room downstairs. Looking down the stairway she could see light under the dining room door and hear stealthy closing of drawers and the muffled chink of silver being moved. Now, wide awake she aroused the nine-year-old and told her to tiptoe down with her and stand ready at the front door to make a dash for the neighbors on command. Thus supported the mother flung open the dining room door with a forceful "What's going on in here?" only to find the five year old carefully setting the table for breakfast. "What in the world are you doing?" the mother asked. The little girl looked quite crestfallen. "I wanted you to think the fairies had done it," she said.

How was a five year old to know that soft noises of silver being lifted in the middle of the night would suggest, to a mother, a project for the police rather than an undertaking of the fairies?

Recently on an afternoon's drive with a four-year-old from an inland state we skirted a coastal inlet where the receding tide had left a stretch of shore with a boat high on the sand moored to a landing. The little girl gave the boat, shore, rope and pier a long look. "Why is the boat tied?" she asked. In her experiences horses were tied to hitching posts, but horses have the power of movement. Why should a solid wooden object be tied to another wooden object, and how could an inland bred child know that the sea would change position during the day under the influence of the tide?

Both these stories suggest the part experience plays in the differing perceptions of children and adults. Both suggest that learning is involved in perception. Let us see now what further light is shed by systematic studies.

Characteristics of the Perceptions of Young Children

Turning first to perception of the physical world, we find investigations of the perception of form, color, size, position and distance, quantity and number, time, picture content, animism, and physical causality.

Perception of Form

How early in life can young children discriminate between different forms? Apparently under 6 months of age. In a test of this ability (Ling, 1941), 50 infants ranging in age from 6 to 16 months

were confronted by pairs of blocks of different geometric form—circle, triangle, etc. The correct block was sweetened with saccharin, the other was securely fastened to the board on which the blocks were presented. Infants as young as 6 months quickly learned which form to reach for and were unaffected by changes in its size or spacial orientation. This early development of form discrimination is also revealed in interest in and response to the human face by infants as young as two months of age.

With increasing age and with practice, infants can make finer form discriminations. One investigator (Welch, 1939a), working with calibrated test material and small numbers of subjects, found that a fourteen-month-old child was able to distinguish between an 8 x 8 and a 12¾ x 3¼ piece of plywood.

Form can be tactually as well as visually discriminated by young children. In a study (Benton, 1949) employing 156 three-, four-, and five-year-old subjects, children were asked to feel and name eight common objects presented one at a time in a curtained box. Children's scores revealed a small progressive increase in ability with age. As language ability entered into correct response, this study suggests the desirability in any test of having children match a felt object with one of several presented visually and simultaneously, instead of naming the felt object.

Influence of Verbalization

A factor other than age and practice in the child's ability to discriminate between forms is his ability to verbalize differences. In a test (Gellerman, 1933) of two-year-old children's and chimpanzees' discrimination of a triangle presented with another geometrical form, the triangle, regardless of its size, position, or background, always led to a reward. In this situation the two-year-olds did better than the chimpanzees, their remarks and gestures indicating that they were helped by verbalizing and symbolizing the solution.

Influence of Orientation of Form

It is a matter of common observation that young children often enjoy looking at their picture books upside down as well as right side up. Does this mean that their perception of pictorial form is unaffected by its spatial orientation on a page? The following thoughtfully designed studies indicate that this is actually the case and that it leads to young children making somewhat different classifications of pictorial and graphic forms than adults do.

In one study (Rice, 1930), 226 children between the ages of 2.7 and 9.3 years of age were tested in identifying a diamond form under the following test conditions. They were first shown a drawing of a diamond in the vertical position and then asked to find it on a sheet of drawings which included some vertical diamonds. They then were shown a diamond in the horizontal position and asked to find it on a sheet of drawings that included some horizontal diamonds. Later they were shown a horizontal diamond and asked to find it on a sheet of drawings which contained vertical diamonds and still later to find a horizontally presented diamond on a sheet containing both horizontal and vertical diamonds. Briefly, the results indicated that children under five years of age were little concerned with the diamonds' orientation on the page. Moreover it was not until the children were between five and six years of age that children of different ages began to show any appreciable difference in the degree to which they took the orientation of the diamond into consideration.

The part that reaction to orientation of forms may play in reading readiness is suggested in another study of identification of the letters *d*, *b*, *p*, and *q* by 48 kindergarten and 111 first grade children (Davidson, 1935). Each child was asked to match each of these letters with a set of ten letters, five of which were identical with the test letter and five those most likely to be confused with it. The children's responses revealed four stages in discrimination:

Stage 1) *d*, *b*, *p*, and *q* were seen as identical, each of them consisting of a circle and a line.
Stage 2) *d* and *b* were distinguished from *p* and *q* by virtue of the line or stem facing up or down.
Stage 3) *d* and *b* were seen as the same letter facing different ways.
Stage 4) *d* and *b* were recognized as different letters.

Practically all of the kindergarten children confused *d* and *b* with *q* and *p*. The most difficult discrimination was that of reversal (*d* and *b*), next in order was inversion (*d* and *q*).

The help children need in developing this discrimination is similar to that given to air force observers in spotting types of airplanes, namely in having their attention directed to such cues as position of the stem.

In summary, form discrimination develops in the first six months of life and can be measured at different ages in terms of the differences in dimension that can be successfully discriminated. Dis-

crimination increases with increasing age, with intelligence test score, and with practice. It is aided by verbalization. Identification of objects on a page is relatively unaffected by their orientation on the page at ages under 5 years. This creates a reading problem for young children as such letters as *d*, *b*, *p*, and *q* tend to be recognized as the same letter because of their common stem and circle form.

Perception of Color

The objects in a young child's environment have color as well as form. Which influences him more in his perception of objects, color or form?

Relative Dominance of Color and Form in Object Perception

Two studies furnish information. In one, *developmental level* is proved to be a factor. In this study (Brian, 1929), 219 children aged 1–6 years, 216 elementary school children, and 40 adults were required to match a colored geometric form with one of two other forms, one of which was the same color but a different form, and the other of which was the same form but a different color. (See Figure 69.) Colors used were primary and saturated; forms were such clearly differentiated ones as a square, circle, or triangle. The younger group's response (shown in Figure 70) indicates that under 2½ years children's matching choices were largely based on form similarity. Over 2½ years there was a steady increase in matching choices based on color, with a peak at 4½ years. After this period there was a decline in color matching and an increase in form matching. At the adult level, 90 per cent of the matching choices were based on form. This

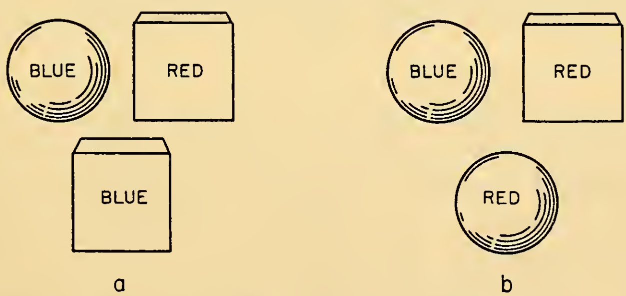

Figure 69. Illustrating placement of forms before children. From C. A. Brian and F. L. Goodenough, "The Relative Potency of Color and Form Perception at Various Ages," *J. Exp. Psychol.*, 1929, *12*, 197–213.

suggests a developmental sequence in perception of objects with form or color characteristics dominant at different periods.

The developmental factor is, however, not the only one determining the relative dominance of form and color in perception. In another study (Huang, 1945a), the *relative intensity of color and form* stimuli was also found to affect responses. In a test situation

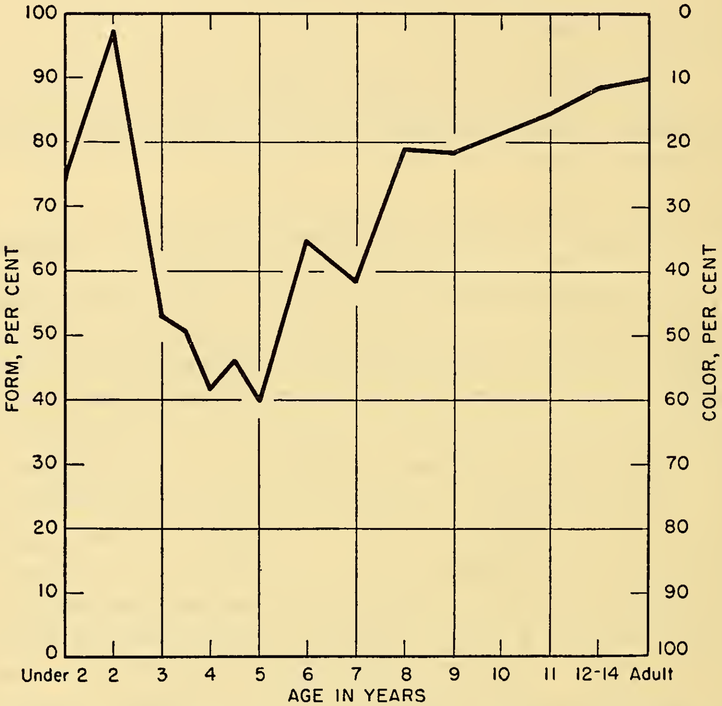

Figure 70. Age changes in color-form perception. From C. A. Brian and F. L. Goodenough, "The Relative Potency of Color and Form Perception at Various Ages," *J. Exp. Psychol.*, 1929, *12*, 197–213.

similar to that described above, 30 children, aged 3 to 6 years, matched on the basis of color 87.5 per cent of the time when marked color differences (complementary colors) were paired with slight form differences (square and rectangle, or circle and ellipse). Conversely they matched on the basis of form 93.1 per cent of the time when large form differences circle, irregular shape) were paired with slight color differences (red and pink, or 2 saturations of yellow). In further elaboration of this situation, it was found that when children were given a series of matching tests in which the

form of the objects remained the same but differences in color progressively increased, color matching choices increased. However, correlations of .44 and .83 between children's performances on different tests in each series suggest the extent to which individual differences affected responses.

There was also evidence that the *meaningfulness of forms affected response.* For example, when a hat and boat were the forms involved, form preference choices were 100 per cent, with geometrical figures form preference choices were 75 per cent, and with paper dresses of various shapes, form choices were zero, color choices 100 per cent.

Turning now to perception of color per se, we find studies of children's color preference, their matching and naming of colors, and their ability to differentiate a colored figure from a different-colored ground.

Color Preference

In a color preference test (Staples, 1932), 25 infants approximately 87 days of age were propped in a sitting position in their cribs twelve inches away from a neutral gray screen on which a gray and a colored disc, each 3 inches in diameter, were pasted 6 inches apart. The tester, behind the screen, observed through a narrow slit and recorded by means of a stopwatch, the amount of time spent looking at each disc and around the room. After a two-minute exposure, the tester played with the child, reversed the position of the gray and colored discs, and retested the child in this way with all the primary colors.

Using the same test material, over a hundred children 5½–24 months of age were first asked "to get the ball" when one disc was gray and one colored, and were then retested by having each color paired with each other primary color.

These tests revealed that infants of three months of age spent twice as long looking at the colored disc as at the gray one, and that up to 24 months of age there was a marked preference for red. Beyond this age, tests with older groups revealed decreasing group preference for any particular color.

Relationship between Matching and Naming Colors

Children apparently discriminate colors better when they can name them. In a test of color matching and color naming (Cook,

1931), 110 children, 17 to 72 months of age, were asked to name and match Munsell color hues in three different light and saturation values. At two years children matched correctly 45 per cent of the time and named correctly 25 per cent of the time. At six years they matched with 97 per cent accuracy and named with 62 per cent accuracy. Hue was matched more accurately than light and saturation values of a given color. A correlation of approximately .9 between color naming and color matching suggests the part that naming plays in color differentiation.

Color Discrimination in Relation to the Color of the Background

Color discrimination is apparently not functioning on an all-or-none basis. Evidence that children's ability to discriminate a colored form is affected by the color of the background against which it is seen is offered in a study (Synold, 1949) in which 74 children, 3 to 8 years of age, were asked to trace with a paint brush a colored figure on a background of a different color. Using 28 Dvorine Color Perception Charts, the investigator found that only half the subjects traced all 28 digits, and that there was a range from 78 to 100 per cent accuracy in the group. Some hues were discriminated better than others, and some hues were more successfully discriminated against some color backgrounds than others. For instance, 100 per cent of 4-year-olds discriminated a green digit on a red background, only 63 per cent a green digit on a yellow background. At the 6 year level, 94 per cent discriminated a yellow digit on a green ground, only 22 per cent a green digit on a yellow ground.

In summary, the relative potency of color and form in young children's perception of objects appears to be related to their developmental level, to the relative intensity of color and form stimuli presented, to the meaningfulness of the forms employed, and to individual patterns of perception. Interest in color is present by three months of age, and there is a marked preference for red up to 24 months of age. Color matching and color naming increase with age. Though naming lags behind matching, a correlation of .9 between the two suggests the part verbalization plays in learning color discrimination. Hue is differentiated more easily than brightness and intensity characteristics. Differentiation of a colored figure on a ground of a different color is dependent both on the color of the figure and the figure-ground color combination, with some evidence that a color is more easily discriminated when presented on a background of its complementary color and that a warm color on a cool-colored ground is easier to discriminate than a cool color on a warm-colored ground.

Perception of Size

How early can young children estimate the size of an object independent of its distance from the observer and of the size of its projection on the retina?

Apparently this ability develops in the first six months of life. In a study of visual size constancy (Cruickshank, 1941), 73 infants, 10–50 weeks of age, were presented with a pair of rattles one of which at a distance of 75 centimeters was three times the size of the other one presented at 25 centimeters.

Despite the fact that the large rattle at 75 centimeters made the same size projection on the retina as the small one at 25 centimeters, babies as young as six months of age reached more often for the small near rattle than for the large distant one.

As for the ability to differentiate between two objects of different size at the same position from the observer, experimental tests (Welch, 1939b) show that young children show great improvement with practice. In one case a child under 2 years of age made a successful distinction between an 8 x 8 and an 8¾ x 7¼ plywood plate.

In addition to measurements of discrimination of gross size differences, there has also been some study of children's ability to discriminate three comparative size gradations—large, small, and middle size. Such studies (Thrum, 1934, 34 children, 2–4.7 years of age, and Hicks, 1939, 40 children, 2–5 years of age) show that "big" (as applied to toy cars, circles, and squares) is somewhat more easily distinguished (88 per cent success) than "little" (80 per cent success), and that "middle size" (48 per cent success) is the most difficult of the three discriminations though it can be improved by practice.

Emotional as well as cognitive factors play a part in young children's perception of size. In a study (Lambert, 1953) in which three- to five-year-old children were given an opportunity to acquire tokens in a series leading to a reward, the kind of token that occurred last in the series was estimated, in a size determination test, as being larger than it was; the tokens occurring earlier in the series were not perceived as larger than they were.

Characteristics of size discrimination in early childhood are therefore that some degree of visual size constancy develops within the first year of life, and that fine discriminations between gross size differences increase with age and with practice and are more easily made between objects having the same form than between those having different form. "Big" is discriminated somewhat more easily than "little." "Middle sized" is a more difficult discrimination than "big" or

"little" but is improved with practice. Further, judgments of size are affected by the value of the object for the child judges.

The development of visual size constancy is inseparable from the perception of distance. Let us, therefore, consider further evidence concerning the young child's perception of distance, position, and spatial relationships.

Perception of Distance, Position, and Spatial Relationships

Stereoscopic Vision

In a test of stereoscopic vision (Johnson, 1941), 23 children (2 to 6 years of age) were fitted with polarized spectacles, seated 20 inches from a screen, and asked to reach for a doll projected by stereoscopic photographs 10 inches in front of the screen. On the basis of children's touching distance for single and double pictures, it was clear that children as young as 2 had stereoscopic vision and that ocular convergence was an important and perfected cue for judgment of size and distance.

In another test (Updegraff, 1930), involving a comparison of young children's and adults' judgment of distance, 10 four-year-olds and 6 adults were asked to determine the nearer or farther of one of two objects of the same size set at unequal distances from their eyes. Here young children as a group showed little difference in accuracy from adults. However, before conducting this test, Updegraff checked child subjects of different ages on their understanding of such distance terms as "nearer" and "farther" and found that it was not until four years of age that these terms were understood by the majority of children.

This raises a question concerning the verbal space concepts of young children. We are all aware that infants under one year can react with appropriate movements to such words as "up" and "all gone"; but what of older children's understanding and use of space and position terms.

Developmental Sequence in Acquisition of Verbal Space Concepts

In one study (Holmes, 1932), 33 kindergarten and 40 nursery school children were asked to act with a doll parts of a story which included size, shape, and position concepts. In another (Ames and Learned, 1948), a record was made of the spontaneous space verbalizations of 20 or more children at each 6-months level from 24 to 48

months of age. In addition, each child was asked a series of questions including, for example, where he lived, where he slept, where he ate dinner, where airplanes fly, and where worms and birds live.

On the basis of these two studies, children were found to develop concepts of upness before those of downness and to respond to questions of location in general terms first. Thus at 2 years, "where do you sleep?" was answered "at home." Later, "in my bed" and still later, "in the bedroom." There was also a developmental progression from words denoting an absolute position like "over" or "under" to those suggesting comparative positions such as "nearer" or "farther," or to such qualified concepts as "way up," or "way down."

The period between 24 and 30 months was noted as the one in which the most new space words were added. This is also the period of rapid increase in total vocabulary, and of insistence on having things in their proper places.

In developing notions of position, what points of reference do young children use—their own position or that of objects?

Cues Used in Perception of Position of Objects

Evidence that young children used the position of objects as a point of reference rather than their own position is offered in two studies. In one, (Miller, 1934), 98 children between 11½ and 16½ months of age were shown two boxes, one red and one yellow. The experimenter said, "See these boxes. Now I'm going to hide this dog under a box. Look!" The toy was hidden. A screen was then interposed between the boxes and the child for 10 seconds. At the end of this interval the experimenter said "See if you can find the dog." After two successive correct responses the position of the boxes was changed during the interval after the toy was hidden and while both boxes were screened from the child's view. Figure 71 shows the changes in position of the boxes and the possible cues the child might respond to.

The children's responses showed that the youngest children (4 under 24 months) responded in terms of the position of the box, relative to the other box. From that age up to the 5 year level, there were increases in response to color as a cue. At no age was position of the box relative to the subject frequently used as a cue.

Another study indicates that children's perception of position of an object in relation to other objects is dependent on their ability to symbolize or verbalize this relationship. For instance, when an

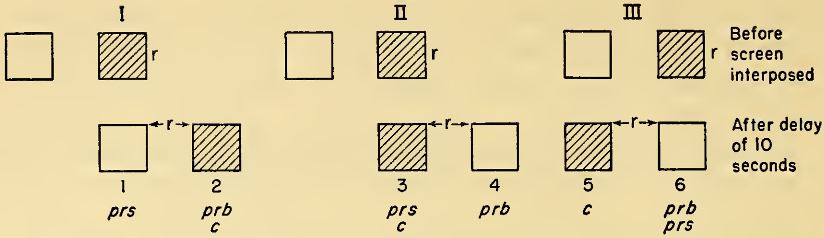

Figure 71. Critical test of cues used in delayed reaction. From N. E. Miller, "The Perception of Children," *J. Genet. Psychol.*, 1934, *44*, 321–339.

The top line represents the original position of the boxes in each of the three tests. The lower line represents the critical choice positions. Each box is designated by a number for purposes of reference. *c*, choice on the basis of color; *prs*, response to position of box with respect to the child's own position; *prb*, response in terms of the position of one box in relation to the position of the other box. If the cue were color, boxes 2, 3, and 5 would be selected. Should the cue be position of the box with respect to himself, the subject would respond to boxes 1, 3, and 6. However, if the box presenting two cues were selected, the child would respond to 2, 3, and 6. There are four other theoretically possible cues.

investigator (Leuba, 1940) hid a chocolate in a match box which was either part of a geometric configuration of match boxes or *apart* from such a configuration, children between 1½ and 5½ years could only locate the chocolate when the box was *apart* from the configuration or the end box in a line configuration. They even pleaded with the tester to put the chocolate in the end box when he arranged the boxes in a line.

Anyone who has played a run-and-chase game with a young child has probably noticed that the child follows in the adult's footsteps rather than taking short cuts to catch him. This suggests that the child does not take into account the effect on the position of objects of shifts in his own position.

Child's Estimation of Position of Objects Relative to Changes in His Own Position

In an experimental study (Meyer, 1940, 45 children, 2 to 5½ years of age) of developmental changes in the ability to take into consideration the effect of shifts in own position on position of objects, a child was seated at a table with a box and toy in front of him. The experimenter, sitting to the left of the child, moved the toy to the left and around to the back of the box and then told the child to find it. At the lowest level of performance, children finding

their way to the left blocked by the experimenter gave up. At the second level after trial and error, children sometimes got around to the back of the box while at the third level they immediately and correctly reached the back of the box by going to the right.

In this and similar test situations there was evidence of a progression from taking the position of the self as a permanent center of reference to increasing awareness of the effect of changes in self position in relation to position of objects.

Influence of Learning on Position Concepts

That learning as well as maturation plays a part in position concepts is indicated in a study (White, 1931) in which 23 children between 2½ and 5½ years of age were asked to point to pictures mounted on a page in 4 rows of 4 pictures each and to put check marks in circles arranged on a page in 4 rows of 4 circles each. In the first test, 21 of the 23 children pointed to pictures in an irregular random order and in the second 14 used an irregular order in putting check marks in squares. This was in contrast to adult subjects who all used a left-to-right reading and writing response.

In summary, young children's perception of distance, position, and spatial relationships is affected both by developmental factors and experience. Stereoscopic vision develops early. By the end of the second year of life, there is evidence that ocular convergence is an important and perfected cue for judgment of size and distance. By the fourth year, children perceive differences in distances of paired objects about as accurately as adults. Position is perceived in relation to other objects before it is comprehended in terms of changes in the position of the self. Though correct judgments of distance and position can be demonstrated prior to the existence of verbal concepts, the ability to verbalize position is an aid in its determination. Such verbalization reflects the child's comprehension of absolute positions like "up" and "down" before the comparative relationships of "nearer" and "farther" are understood.

Perception of Quantity and Number

Animals have no sense of number. One egg taken from a dozen does not disturb a brooding hen, one kitten removed from a litter of six brings no perceptible response from the mother cat. The fact that one kitten removed from a family of two, or two removed from a family of three does bring a response indicates only

that puss has some notion that what was plural has become singular. Adults when not counting do no better than animals in distinguishing groups above six, as any person who has ever taken a number of children on an excursion can testify.

Numerals, therefore, function as compensations for shortcomings in our perceptual ability. They are to quote Riess (1943,a.b.), "names which make every stimulus distinctive." They have an ordinal function in defining successive stimuli, a cardinal function in defining the sum total of stimuli presented.

How do concepts of number develop? How do young children proceed from perception of magnitude to that of multitude? Most children under eighteen months look for one object lost from a group of three, but if two or three objects are lost from a group of four and one is found, the child does not seek further. This suggests that the child is responding on a "one" and "many" or "this" and "that" rather than a numerical basis. This is in line with his experience. At a prenumerical level a child, even in the first year of life, gains considerable experience in aggregation—assembling, filing, collecting, and accumulating—and in isolating, dispersing, and separating.

From these simple experiences what is the progression to numerical characterization of objects and events?

Three investigations suggest the processes involved. In two (Long, 1941, 135 children, 30–83 months, Coward, 1940, 25 children, 3–6 years), children were given tests in rote counting, object counting, producing numbers, matching, naming, and combining numbers, and selecting the larger and smaller of two groups of objects. Correlations under .5 between children's performance on different tests suggest that somewhat different abilities are involved in discriminating and matching and in selecting the larger or smaller of two groups.

There is also evidence of a developmental progression from enumerating objects one at a time to perceiving them in a collective sense. As Riess (1943a,b) observes, the perception of successiveness involves fewer associations than perception of number in the collective sense. It is therefore not surprising that young children learn to count up to ten before they can hand over five marbles from a pile. It is also not surprising that they resort to counting on their fingers when trying to combine numbers. Incidentally, they show little ability in combining numbers or understanding fractions until they are six years of age.

In a third study (Martin, 1951, 150 children, 3–7 years of age), an attempt was made to determine whether children's number ability is related to their ordering and organizing experiences in an unstructured situation in which they are simply asked, "What do you see?"

In such a situation, children's scores are in terms of their vocabulary of number, size, and quantity, their enumeration by items or by groups, and whether their grouping is based on a single characteristic or a variety of characteristics.

Children's responses in this test revealed that they do discriminate stimuli in quantitative terms, that there is an increase in concepts of number and quantity with age, and that this increase is reflected both in greater vocabulary and in greater differentiation of groups and subgroups. As to group differentiation, there is a progression with age from classification on the basis of one characteristic to discrimination of groups and subgroups on the basis of several common characteristics. Children who made the most differentiations were also the ones with the largest vocabulary for number and quantity characteristics.

It would seem, therefore, that development of the ability to differentiate and integrate on the basis of common characteristics paves the way for development of number concepts and that both processes are facilitated by increasing vocabulary. Interestingly, however, there was little relationship between children's number-ability test scores and their performance in the unstructured number situation, suggesting that tests of maximal versus typical behavior measure somewhat different types of functioning. Children from parents in professional and executive occupations did better on these tests than those of parents in semiskilled and unskilled occupations, indicating, at least *in part*, the influence of socialization in different occupational groups on the perceptual process.

In summary then, perception of magnitude precedes perception of multitude. Numbers at first represent an extension of the naming process and are learned as a serial order before they are understood in a collective sense; perception of successiveness being apparently a simpler process than perception of numbers in the collective sense. Prenumerical experience of aggregating and isolating and the progressive development of the ability to differentiate and to integrate pave the way for development of perception of number. Development of differentiation and of perception of number are facilitated by development of vocabulary.

Perception of Time

How do young children develop concepts of time, of the sequence and duration of events?

In a nursery school some children were playing with a ball which dropped down a crack in a porch undergoing repair and rolled under

> the house. The children made various futile attempts to reach it until the teacher told them that tomorrow she would bring her walking stick and that they could push it under the house and hook out the ball. Unfortunately the teacher forgot her promise. Next morning one of the four-year-old boys said to her, "When is tomorrow?" Wishing to relate the sequence of events that would mark the passage of time the teacher said, "When you go home after lunch, you will have your nap, then you will get up and play, after supper you will go to bed. Then, when you wake up in the morning, it will be tomorrow."
>
> "And that's the day you bring your walking stick," the little boy said. With a flash of remembrance and contrition, the teacher realized the hopelessness of further explanation and one tomorrow was lost forever.

Systematic studies of young children's perception of time have been concerned with compiling verbal expressions of time by children of different ages, asking questions concerning such divisions of time as the morning, afternoon, day, week, month, holiday season, or year, testing the child's understanding of fifty words relating to time, and investigating his understanding of clock time. On the basis of statements made and questions answered by 102 children ranging in age from 18 months to 8 years (Ames, 1946), it appears that words indicating the present come first, that time in relation to the end of things is understood before the beginning, that time is understood in terms of activity, that parts of the day, morning and afternoon, are understood before the day of the week, and that the children knew their own age by the time they were three years old. The months, the season, the year, the day of the month, and the time of day were not known by a majority of the children in this study until seven or eight years of age.

Other evidence of a relationship between time concepts and developmental factors is offered in the comprehension of 50 words relating to time by 160 kindergarten, first-, second-, and third-grade children (Harrison, 1934). Children's scores correlated .58 with their chronological age. With their school grade the correlation was .66 and with mental age .70.

In a test of knowledge of the clock and of clock time in 89 four-, five-, and six-year-old children in Hawaii (Springer, 1951, 1952), it was found that there was a developmental progression from descriptive time (sequence of activities), unreasonable time (15 o'clock), reasonable but incorrect time, to correct time. Telling time and setting a clock was first possible on an hour basis, then half and then quarter hour.

Studies made so far of young children's perception of time have been largely restricted to clock and calendar units. Time as a subjective experience has still to be explored. That such exploration

would be revealing is indicated in the remark of a four-year-old boy which showed his awareness of the immutability of time.

> Dick was very partial to prune whip and always very pleased when it appeared on the table. One noon when he was back in nursery school after a week's absence, and had his favorite dessert placed in front of him, he drew a deep breath of anticipation, and holding his teacher, his friends and his dessert in a warm glance of love he said, "I wish I wouldn't be born for a hundred years. When you're born, after awhile you die. When you die, you're dead forever." An English novelist similarly remarked concerning a farewell between friends, "In each instant of our lives we die to that instant." Dick too was savoring the passing of an instant in which friends and prune whip were happily combined.

Development of a sense of time in early childhood is marked by a progression from understanding time in relation to activities to understanding divisions of time, such as morning or afternoon, in terms of customary activities, to finally understanding calendar and clock time. Time as a sequence is understood before time as duration. Hence the child first grasps concepts of the present, the immediate past, and the immediate future. He also understands time as an end of something going on before he grasps it as a beginning of something not yet experienced.

Young children's perception of form, color, size, distance, position, number, and time reveal some of the general characteristics of their perceptions. Children are, for example, helped in differentiating by their ability to verbalize. They improve with practice, suggesting the part experience plays in development of perception. Further, their difficulty in dealing with ambiguities, fine distinctions, and comparative versus absolute differences reflects a progression in their differentiation from coarse to fine and from simple to complex. In studies of perception involving possibly a higher level of abstraction, still further light is shed on the perceptual process. As illustration, let us see what developmental stages are apparent in figure-ground perception.

Figure-Ground Perception

Adult-Child Comparisons

Twenty-three children, 3.8 to 5.8 years of age, and 20 adults were shown a test card depicting a geometrical figure on a lined background. After a constant time interval, the test card was removed and the subjects were shown a set of 6 cards and asked to find the card just shown. (Meister, 1949.)

In four series, in which four different forms were used, the six cards had a constant background, but forms of different size. (See Figure 72.) None of the cards in the set had the same form size as the test card; therefore subjects' choices revealed their tendency to overestimate, underestimate, or approximate (by distributing their choices above and below test card form size) the size of the figure.

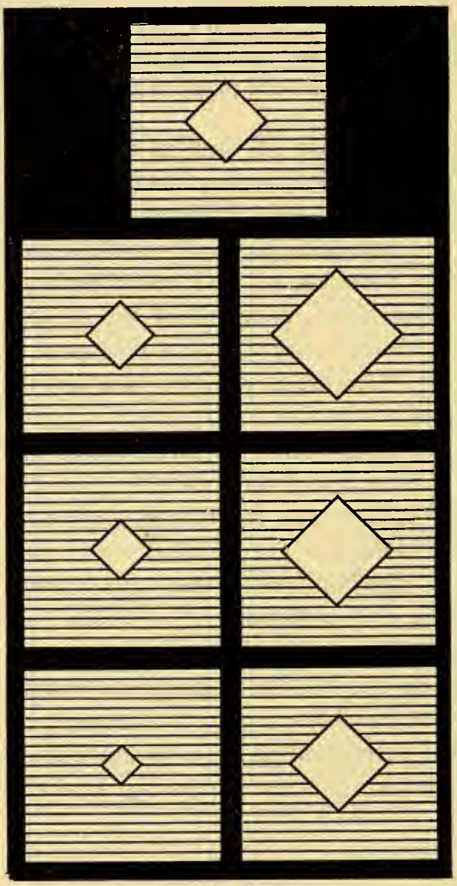

Figure 72. Cards used in a delayed reaction test which involved figure-ground perception. From D. Meister, "A Comparative Study of Figure Ground Discrimination in Preschool Children and Adults," *J. Genet. Psychol.*, 1949, 74, 311–323.

In another four series the form was constant in each set of six cards presented (Figure 73), but the backgrounds differed in density. Again no card in the set of six had the same background density as the test card. The only difference in presentation of these test series

to adults and children was that adults were asked to find the card most like the test card.

The results were that young children tended to choose a larger figure (at the 1 per cent level of confidence). No such tendency was found in adults. Adults, however, tended to choose a denser ground to a slightly greater extent than the children did.

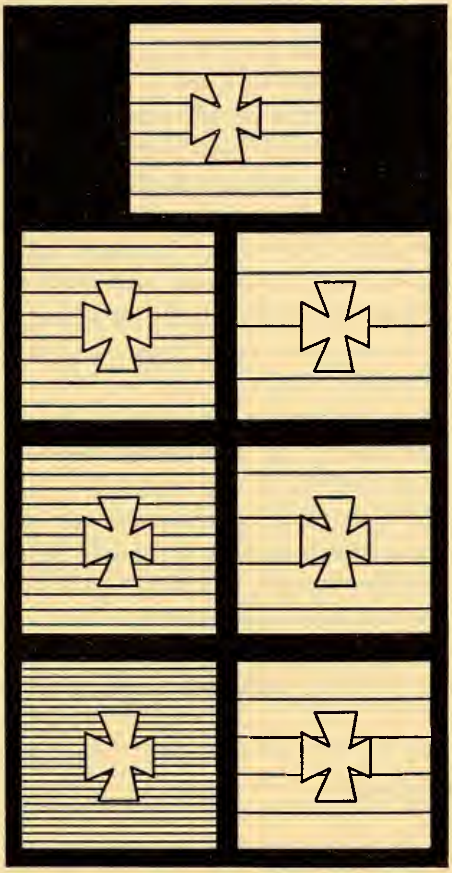

Figure 73. Cards used in a delayed reaction test which involved figure-ground perception. From D. Meister, "A Comparative Study of Figure Ground Discrimination in Preschool Children and Adults," *J. Genet. Psychol.*, 1949, 74, 311–323.

Within the limits of the small number of subjects represented, these results are interpreted as showing greater adult-child similarity in ground perception because this is a more primitive response. The young child's tendency to see the figure as larger than it is, is similarly interpreted as a more primitive response than the adults in that the figure is less differentiated from the ground. As Figures 72 and

73 show, a small figure is more sharply differentiated from a given ground than a large figure. Similarly, a denser ground makes a figure appear in sharper contrast.

As in other areas of perception, the developmental factor is not the only one involved in children's response.

Perseverance, Direction, and Learning in Figure-Ground Perception

The part that perseverance, direction and learning may play in form abstraction is suggested in a study (Crudden, 1941), in which 65 children aged 65–78 months of age were asked to find a previously learned symmetrical or assymetrical figure which was incorporated into one of a pair of background figures. The children's number of errors and length of time spent in abstracting revealed that successful abstractors persevered longer, that they did better after being told which of the paired backgrounds contained the learned figure, and they improved on retest after being shown the correct solution to a test on which they had failed. Symmetrical figures were abstracted more successfully than asymmetrical ones.

In terms then of the meager evidence at present available, it appears likely that the ability to differentiate figure from ground increases with age, is improved by learning, and is related to the perseverance and directed attention of the perceiver. A mature response is one in which figure and ground are sharply differentiated, as contrasted with a primitive response in which figure and ground are perceived more as an undifferentiated whole.

Somewhat related to the discriminative process involved in figure-ground perception is young children's response to pictures.

Perception of Pictures

An interesting study of this problem is reported by a French psychologist (Cramausset, 1924). He obtained three- and four-year-old children's responses to a stamp and to some paintings and was impressed by the infinite variety of their responses. The variety resulted from the children's interpretation of a total picture in terms of one or perhaps two specific details. Cramausset writes "the triumph of the child's perception lies in the construction of simple entities limited to one object only. It is not very important if that object is unknown—the child quickly assimilates it to known things—a comb, or a chandelier become a fork, a peacock becomes a butterfly." Cramaussett describes the process of perception as similar to caricature,

the child "recognizes a dominant trait in the midst of an uncertain and indifferent all together. He goes from the same to the similar and unifies his impressions of objects not as adults do in terms of usage and experience, but in terms of play."

An American psychologist (Amen, 1941) also notes in children's response to pictures, the tendency to treat a detail as standing for the whole. She reports a developmental progression in the number of details that can be taken into consideration.

Young children's response to pictures therefore suggests that their perceptual process is characterized by selection and interpretation of one rather than all details of an experience, by their tendency to treat the similar as the same when they are dealing with unfamiliar stimuli, and by their considering objects in terms of play rather than utility.

The pictures children make themselves similarly reveal a limited and selective attention to one or a few of the dominant stimuli presented by an object.

Consider the following, for example:

> Before Christmas John and David were standing alongside a painting easel. John picked up a brush and said: "I'm going to make a picture of the baby Jesus." David said: "Is he a real person?" "Yes," said John, completing a circle for a head and attaching a larger one to it, "he had a stomach." "Now," he said, "I'll draw the Virgin Mary." "Is she a real person?" asked David. "Does she have a stomach?" "Yes," replied John, "Jesus was in her stomach." John completed the second figure, picked up another brush and said: "Now, I'll draw God." "Is he a real person?" asked David. "No," said John, drawing this time only a head and then removing his painting to the wire to dry.

Progression with age in children's drawings is thus in terms of more stimuli taken into consideration. As taking stimuli into consideration is a factor in intelligence test performance, young children's drawings of such familiar objects as a man or a house thus reflect not only their age but also their intellectual maturity. (See Figures 74 and 75.) Interestingly enough, as children take more stimuli into consideration, they become less satisfied with their own drawings.

Passing now to perceptions of even greater complexity, it has been noted that young children sometimes speak of objects as if they were alive.

Perception of the Animate and Inanimate

A European psychologist, Piaget (1928, 1930), on the basis of questions asked an undisclosed number of Swiss children, defined

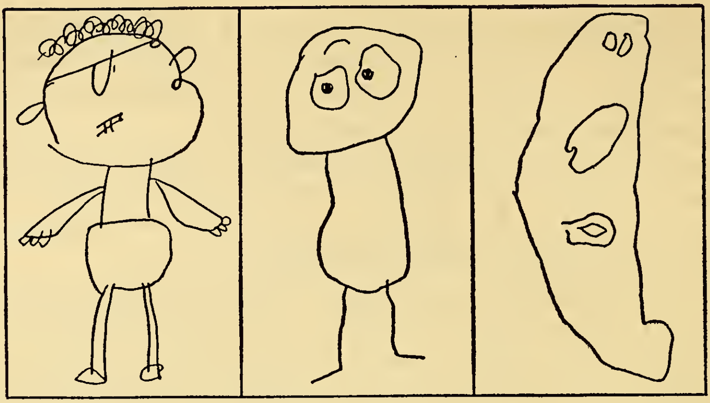

Figure 74. Drawings of a man by bright, average, and dull kindergarten children (from left to right). From F. L. Goodenough, *Measurement of Intelligence by Drawings.* World Book Co., 1926.

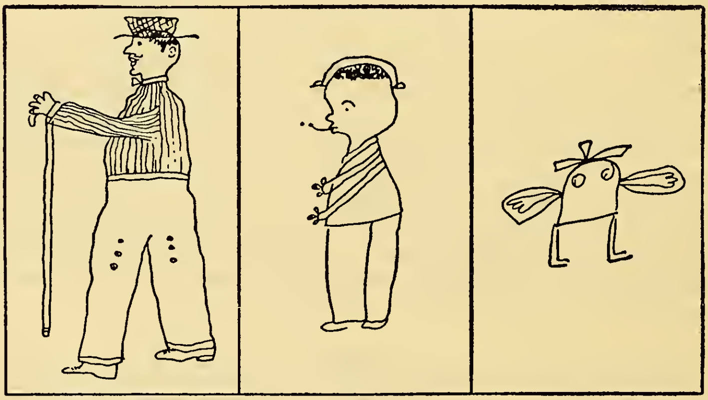

Figure 75. Drawings of a man by bright, average, and dull eight-year-old children (from left to right). From F. L. Goodenough, *Measurement of Intelligence by Drawings.* World Book Co., 1926.

four developmental stages of animism and four age periods during which children passed through each stage. Briefly, they are as follows:

Stage 1. 4 and 5 years of age.
All objects that function and are unbroken are considered alive.

Stage 2. 6 and 7 years of age.
All objects that move are considered alive.

Stage 3. 8 and 9 years of age.
All objects that move spontaneously are considered alive.

Stage 4. 11 years.
Only plants and animals are considered alive.

Other investigators who attempted to test Piaget's conclusions offer evidence that the stages he described are not as unvaryingly associated with particular age periods as he suggested.

In one study (Russell, 1939, 1940a,b), for example, over 300 school children were asked whether 20 objects, such as a stove, a dog, a clock, etc., were living or dead and why the children thought so, whether the objects were living when they moved and whether they would move by themselves. On the basis of classifications made by two independent judges, with high agreement between them, only four of the children's responses to these questions could not be fitted into one of Piaget's four classifications. However, all four stages were represented at each age period, though the *majority* of children showed the developmental stage which Piaget described as typical of their age. On the basis of this evidence, the investigator concluded that the age range for Piaget's concept stages was not as limited as he suggested. Correlational measures between concept stage and chronological and mental age were .62 and .59 respectively.

As Piaget's definition of animistic thinking included belief that objects are endowed with will as well as life ("The notion 'living' has been constructed by the child to correspond to an adult word. But it embraces something quite other than the adult notion of 'life' and testifies to an entirely original conception of the world." [Piaget, 1929]), Russell compared children's responses to whether objects were alive with their answers to whether each of the same objects would "feel where it is and know where it is." Children's concepts of "knowing" and "feeling," he found, became realistic sooner than their concept of being "alive." However, coefficients of mean square contingency between correlations of concepts of "alive" and "knowing" and "feeling" were respectively .76 and .73, suggesting somewhat parallel sequences of development.

Two other investigators (Huang and Lee, 1945), dissatisfied with Piaget and Russell's interpretations, pointed out that "living" does not necessarily mean "endowed with will," that even adults' knowledge and use of the term "living" is vague and that children, though unable to differentiate objects on the basis of their being "living," may yet have accurate knowledge of their physical properties. Accordingly they questioned 20 Chinese children between 3.5 and 5.11 and 20 between 6.0 and 8.7 years of age concerning a dog, tree, river, stove, pencil, ball, automobile, watch, and moon. The questions they asked concerning each were: Is it alive? Does it have life? Does it feel pain? Does it want or not want? Is it good or not good? Has it anything it must do?

The children's answers revealed the extent to which differences

in understanding of the terms used led to differences in response. For example, children made fewer errors (9 per cent) when asked if inanimate objects "had life" than when asked if they were "living" (34 per cent answer incorrect). Agreement between responses to "living" and "having life" was 61 per cent at the younger age, 80 per cent at the older age. Further, the children's knowledge of traits, feeling, wanting, etc., was ahead of their knowledge of "being alive." The distribution of correct answers suggests that concepts of "living" can be better explained on the basis of characteristics which are similar to those of living organisms than in terms of a general tendency. Even when an error was made in classifying the objects as living, the object was not necessarily credited with anthropomorphic traits.

It appears therefore that in early childhood there is a gradual evolution of the concept of "living" and "being alive." Children's knowledge of object characteristics is in advance of their complete understanding of the term "alive," with some confusion at first over whether an object having one or more of the characteristics of a living organism is to be considered living. Controversy over developmental stages in animistic thinking is in part due to treating "life," "animism," and "anthropomorphism" as synonymous terms and in part to attempting to equate results from studies made in different languages.

Piaget's conjectures concerning the animistic character of young children's thinking are a part of his integrated theories concerning the development of language, thought, and reasoning. Piaget (1929) describes the child under six as egocentric and prelogical in his thinking, impervious to experience [2] and unable to comprehend the physical world except in animistic, magical, and phenomenalistic terms. Piaget also defines seventeen stages, presumably universal in children of approximately the same chronological age, by which "adult" thinking processes are finally achieved. He further suggests that behavioral stages are paralleled if not determined by mental structural stages.

Examples of the kinds of questions asked by Piaget and of answers representing two stages in conception of physical causality are:

1. Question: Why do clouds not fall?
   Answers: Stage 1. Because they stick. God keeps them up.
   Stage 2. The sky holds them up.
2. Question: What makes clouds move along?
   Answers: Stage 1. We make them move by walking.
   Stage 2. God or man makes them move or they can move by themselves because they are alive.

[2] In a recent publication "The construction of reality in the child" (1954), Piaget's viewpoint is considerably modified. See page 301.

Piaget interprets Stage 1 explanations as reflecting belief in magic, Stage 2 as revealing animistic thinking.

This description of the behavior of young Swiss children is, however, at variance with observations of the behavior of mentally accelerated English and American nursery school children, a fact that has been pointed out and effectively documented by the director of a school for young English children (Isaacs, 1930). As for young American children, the equipment and experiences provided in their nursery schools (and the entire "educational toy" industry) are based on belief that young children are both able and avid to form and revise concepts based on first-hand experience. To illustrate:

> In a university nursery school a three-year-old ran up to another boy at the carpentry bench, his eyes bright with discovery, "I have proof," he said. "There is a bottom to the sandbox." The carpenter ran back with him to the sand box where the young empericist clinched what had apparently been an argument by pointing to his excavation leading to the solid cement bottom of the sandbox.

Let us now see what systematic study reveals concerning young children's notions of physical causality.

Physical Causality

Unfortunately studies on this topic have, with one exception (Oakes, 1946), been made on small numbers of children at any given age. In Piaget's reports it is not clear exactly how many children he questioned at each age level. An American investigator (Grigsby, 1932), whose results are in partial agreement with Piaget's, used 83 children ranging in age from 2 to 6 years in studying the development of concepts of relationship as evidenced in children's answers to six series of such questions as the following.

Series 1 Time. When is it time for school?
Series 2 Space. Where is the block when it is above?
Series 3 Number sticks. How many?
Series 4 Part-whole relationship. Give me part of the blocks. Put some of them in the box.
Series 5 Causative. Why do you put your coat on when you go outdoors?
Series 6 Discordance. Your mother says that you cannot go, but—

Grigsby reports striking similarities between the children's replies and those reported by Piaget. He classifies four stages in children's causal explanations:

(1) Desire, existence, and contiguity in space and time interpreted as cause.
(2) God, man, or animistic endowment of thing itself cited as cause.
(3) Mechanical connection or sources conceived as cause though exact relation incorrect.
(4) Statement of cause and effect and logical inferences.

Despite similarities between Grigsby's and Piaget's results, there were also important differences. Grigsby found mental age more related to maturity of thinking than chronological age. He also found that the maturity of children's response varied with the character of the question, with children's understanding of it and their actual experience. The interjection of God or moral compulsion occurred more at a later than an earlier age, suggesting that it was a step in the transition from "psychological purposiveness" to accurate interpretation. Grigsby concludes that though he finds evidence of the magicalism, moralism, animism, phenomenalism, and other characteristics reported by Piaget, these are related to the concreteness of the question and the mental age and education of the children rather than simply to their chronological age. She also suggests that education may shorten the period of transition from immature to mature responses.

Huang (1943, 1945), who takes issue with Piaget's classification of young children's thought as egocentric, magical, and prelogical, devised an experiment to test Piaget's conclusion that young children base causality on time and space relationships, regardless of any actual physical relationship. As one illustration, Huang put two lighted candles each under a lamp chimney of different size. The small lamp chimney supplied insufficient air, therefore the candle flame waxed and waned. In the large lamp chimney the flame burned steadily. To test the children's ascribing causality to concomitant factors, the following conditions were associated with the fluctuating flame:

(1) Black streaks on the lamp chimney
(2) Blue liquid in the dish the candle stood in
(3) Beating metronome
(4) An electric switch was turned off and on as light waxed and waned
(5) Experimenter tapped on the floor
(6) Experimenter said, "up," "up and down," "down" in accompaniment to waxing and waning flame

In reply to questions as to why the one candle flame waxed and waned, 26 children noted the turning off and on of the electric torch, 20 the blue liquid in the dish, 11 the metronome beating, and 4 the experimenter's saying "up," "up and down," "down." The point

Huang wished to make is that children do not regard *all* concomitant factors as the cause of a phenomenom. They *select* factors on the basis of *similarity* between cause and effect or in terms of relevancy.

Evidence that nonscientific adults do not differ markedly from children in explaining unfamiliar phenomena is offered in a study (Oakes, 1946) involving 77 kindergarten children, 24 second-, 24 fourth-, and 28 sixth-grade children, and 11 teachers of nonscientific subjects. Each was asked 15 questions about common materials and was also called on to explain 17 simple experiments performed in front of him. Examples of the 15 questions were: How were hills made? Where do waves come from? How do clouds stay in the sky? What do roots do for trees? and What are flowers for?

Examples of the simple experiments were: allowing a tumbler full of snow to melt and then asking: "Why isn't the glass full now?"; setting a tumbler full of water outside on a cold night and asking: "Why is the ice above the top of the bottle?"; and before putting a pebble in a glass of water asking: "What will happen if I put the pebble in water?"

Figure 76 shows the percentage of physical, nonphysical and no explanations given by kindergarten children, sixth-grade children, and teachers.

An interesting difference between children and adults is that the

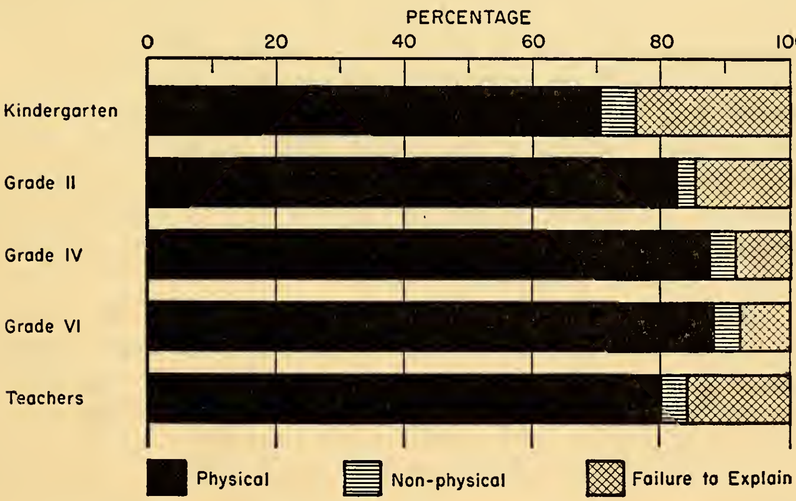

Figure 76. Percentage of physical, non-physical, and no explanations of simple experiences given by pupils and by non-science teachers. From data presented in M. E. Oakes, "Children's Explanations of Natural Phenomena," Teachers College Contribution Education No. 926, 1947, Bureau of Publications Teachers College Columbia University.

children were more willing than the adults to change their explanation in accord with their sense impression, a fact chronicled in folklore in "The Emperor's Clothes." Other findings are that:

> The majority of responses were naturalistic;
> all types of answers were given by all age groups;
> there was no evidence of a definite stage characteristic of a definite age;
> understanding of cause and effect increased with age;
> nonscientific adults followed no definite procedure in explaining phenomena with which they were unfamiliar;
> the nature of the problem, including the wording of the question, was one of the chief factors determining the explanation given. Thus for: "What is the function of flowers?" there were few explanations of a physical type. Most were of the "to smell," "to look pretty" variety, suggesting that children may have interpreted the question as use for people.

Studies of children's adaptive behavior, reasoning, and problem solving (discussed in later sections) shed further light on the development of logical inference.

Meanwhile in the first six years of life concepts of physical causality appear to develop from a neutral indeterminate stage in which the child is little concerned with causal relationship. Even at this stage, however, the child is partially aware of the limits the physical world sets to his activities. Though phenomena whose causalities are beyond the children's range of experience are sometimes explained in anthropomorphic and phenomenalistic terms, children consistently give causal explanations when they can experiment, when they are interested, and when the subject matter is within the range of their understanding. Concepts of causal relationship increase with age, intelligence test score, education, and adequate vocabulary. Adults confronted by phenomena beyond the range of their understanding and outside their sphere of interest or ability to investigate do little better in explanation than young children.

Children's ability to classify objects and experiences in terms of one or more common elements and to arrive at hierarchies of classification also throw light on the perceptual processes and suggests the part that experience and maturity play in their development.

Class Concepts

In a series of studies (Welch, 1939c, 1940a,b,c,d), an investigator, using toy models of a dog, horse, cow, pig, soldier, nurse, hat, coat, shoes, chair, table, carrot, potato, apple, banana, orange,

first asked 93 children, 21–72 months of age, to name them, then to give him all the animals, all the vegetables, all the fruit, the furniture, the clothes, and the people. Then he asked for all the food. He found as a result that children under five and a half years of age were unclear on class concepts.

In an attempt to determine experimentally the part that level of abstraction plays in concept formation, this investigator devised two learning situations each involving a hierarchy of concepts and each totally removed from children's previous experience. In one test, 103 children, 42 to 83 months of age, were taught to differentiate blocks by nonsense names

(1) in terms of their being triangles or rectangles.
(2) in terms of differences in proportion between two triangles and two rectangles.

In another test, 54 children, 67 to 89 months of age, were taught to differentiate a cube from a cylinder by nonsense names which varied with three situations in which they were introduced.

The number of trials required by children to master these concepts in the two tests revealed that the vertical process of concept formation or class identification was much more difficult than horizontal concept formation or object identification. The younger children's responses in this test also suggested the difficulty they had in differentiating an object on more than one basis at a time. This difficulty is also reflected, as will be noted later, in their perception of the occupational and parental role of their fathers.

Some of the children in Welch's tests were drawn from an institution. The fact that they did slightly better in these learning tests than the children from homes led Welch to conclude that deficiency in concepts sometimes noted in institutional children may be more a matter of experience than a lack in native ability.

When children's performances on the hierarchy concepts were compared with those on memory span tests, high scores on one were accompanied by high scores on the other, revealing the association between memory and perceptual processes.

In summary, evidence that young children learn object concepts more easily than class concepts suggests that class concepts involve a higher and more difficult order of abstraction and that they infrequently fall within the range of young children's meaningful experience.

Though studies of young children's perception and conceptualization reveal a developmental progression that appears to be in part due to maturing of the nervous system, the influence of experience is also apparent. It is, therefore, appropriate to attempt some formula-

tion of the kinds of experiences that are likely to stimulate the ability to differentiate, associate, and compare.

Experiences That Stimulate Development of Perception and Conceptualization

One indication of the kind of experiences that stimulate sensory perception is offered in the work of an Italian physician and educator (Montessori, 1912) who undertook to teach retarded children, and found her methods so successful that she adapted them for use with normal children. Basic to her educational procedure was the frequent repetition of what were essentially exercises in sensory perception.

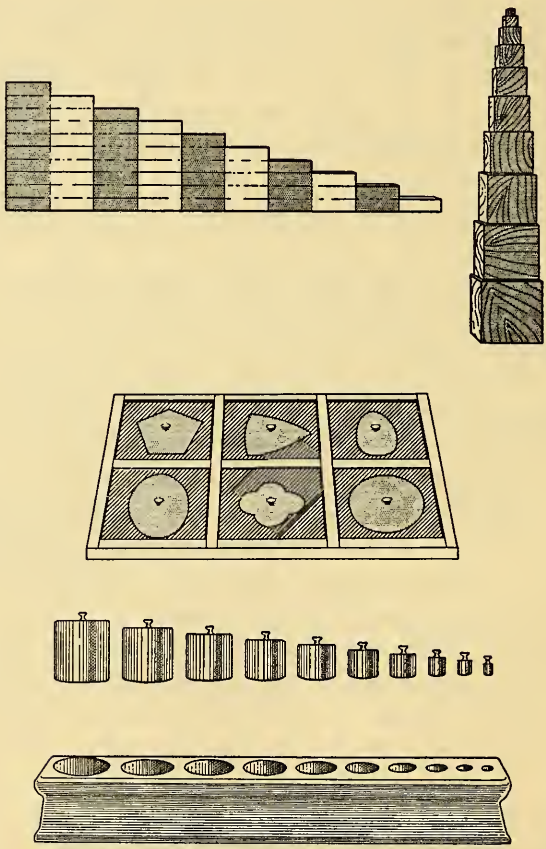

Figure 77. The broad stair, the narrow stair, and form boards of different types. From M. Montessori, *The Montessori Method.* Frederick A. Stokes Co., 1912.

Figure 78. Play equipment designed to stimulate sensory perception.

Sensori-Motor Experiences Requiring a Specific Directed Response

A variety of materials of interest to young children was presented in the form of standard tasks. Thus, children were required to make a broad and a narrow stair out of blocks of progressively diminishing length. (See Figure 77.) Forms of different area and depth were fitted into form boards with matching holes, offering a progression in the direction of change in dimensions. Color samples were matched, tuned bells were paired with those of the same tone, and materials of the same texture were paired together in a smooth to rough progression. The educational content of these experiences lay in the children's learning to respond to the perceptual cues necessary for completion of the task. Successive repetitions, accompanied by satisfaction and adult approval, reinforced a learning process in discrimination of physical attributes.

Though it is doubtful whether such a standardized repetitive didactic process is necessary for the majority of young children, adaptations of Montessori materials used in free play serve a similar function.

Sensori-Motor Experiences Permitting an Individual Adaptive Response

The free spontaneous use of such materials as those in Figure 78 offers opportunities to match, relate, compare, isolate, and aggregate, and to get the sensori-motor experiences necessary for understanding some of the properties of matter. That such experience develops discrimination is suggested in several studies (Welch, 1939a,b,c, 1940a,b,c,d).

There is also evidence that all experiences related to children's interests and adapted to their understanding increase their general fund of concepts (Dawe, 1942).

Experiences Centered in Children's Interests and Designed to Expand Their Understanding of Natural and Social Phenomena

Here is an illustration of such an experience.

The four-year-olds were working at the clay table. One of the girls rolled clay into a round ball. "This is a head for a doll," she

said, "I'll make you a body," offered one of the boys. Soon, head, arms, and limbs were assembled, but then difficulties arose in getting the doll together. While they were working, the teacher asked them if they would like to see a factory where dolls were made. The children were delighted at the prospect. They wanted to know where it was, whose factory it was, and what sort of dolls were made. The teacher told them the factory was in a small building down below the railway line; that it was owned by Mr. Swenson, who had ten women and one man working with him making the dolls.

Next day Mr. Swenson met them at the door of the factory. He showed them the barrels of powdered clay and told them that some of it came from England. He explained that he got it from there because it baked so hard and strong. Then he showed the children the molds for the dolls' heads, bodies, arms, and legs. In a big room lighted with windows ten women were at work dusting off the arms and bodies that had been baked the day before. They talked with the children and Mr. Swenson showed them how they wiped off the parts. In another room, a small motor connected by belts with several large mixers furnished the power for the working and mixing of the clay. The man working there showed the children the glaze he painted on the dolls before they were baked. He showed them a piece of glazed and unglazed pottery, and they agreed that the glazed was prettier. Then Mr. Swenson took them to see where the dolls were baked. The children got inside to see how big the kiln was while Mr. Swenson showed them how the molds were stacked in it. Next he showed them how the molds were made and gave them a few discarded ones to take back and try themselves with their own clay.

The teacher asked Mr. Swenson where he sold his dolls. He told her the towns they went to and the name of a local store that carried them. The teacher said they would like to buy two dolls for the children's house play and would get them from the store. One of the children asked why she didn't buy them from Mr. Swenson. The teacher explained that Mr. Swenson sold them only to stores, and that when people wanted to buy one or two they went to the store to buy them. She said that in the factory, everyone was busy making dolls and had no time or place to sell them. "Shops and stores," she told them, "are on main streets and the people working in them spend all day selling and wrapping up and taking the money for the things bought there." The teacher thanked Mr. Swenson for giving his time to show them around and told him how much they had all enjoyed it. The children drove home with their molds tightly clasped, well pleased with their first glimpse of industry and production.

What young children get from such an experience depends on

what they notice: on what their attention is attracted by or directed to. They are, therefore, helped by having their curiosity stimulated and their attention directed to essential features of a situation they might otherwise overlook. This is a procedure that has been proved effective in a number of experimental situations (Pyles, 1932, Schaeffer, 1930). How is it adapted to home and nursery school situations?

Stimulation of Curiosity and Direction of Attention by Adults' Questions and Method of Presenting Experiences

It has already been noted that young children are laboratory rather than library students. They need first-hand experiences in which they can see, smell, hear, taste, and touch. In such experiences they are often helped by an occasional quiet question, such as "Does the guinea pig have a tail?" if no remark is forthcoming after a rather prolonged inspection of the guinea pig; or, during a visit with a goat and a kid, "Can you make a sound like the nanny goat?" followed later by "Can you make one like the kid?" Adult interjections of this sort should of course be delayed until the child has exhausted his own observations, which may have a somewhat different focus from that of an adult.

Children are also helped by being prepared for a new experience or field trip, by having some idea of what is going to happen and some background of experience that stimulates their selective attention.

In contrast, consider the following story told about Barrie. He once provided "unprepared," unaccompanied child guests with box seats for a production of "Peter Pan," in order to get forthright child reaction to a new actress in the leading role. After the play he joined his guests and asked them "What did you like best?" "What we liked best," they told him with enthusiasm, "was tearing up the programs and dropping the bits on the people's heads in the stalls."

In presenting experiences, curiosity must be satisfied as well as stimulated. Therefore, thought should be given to answering children's questions.

Questions Answered in Terms of the Interest and Understanding of the Questioner

Giving a child a solid discourse instead of a simple answer to his question may discourage further enquiry.

It may also give him information so unrelated to his experience

that it is meaningless. Much early sex information is probably of this type.

A mother explained to her three-year-old Sue that Mrs. B. who had just called on them had, as Sue remarked, "a big stomach" because she was going to have a baby, and was carrying the baby inside her body. Sue's mother reminded her that she, too, carried Sue that way before she was born. "Oh," said Sue, "but did you know that I used to come out at night and play around, and then creep back?," a piece of information that left both her mother and her obstetrician father without further comment and that established an interesting link between child phantasy and primitive mythology.

Answering a child *only* in terms of his question makes it necessary for him to continue to formulate questions until he learns what *he* wants to know. Sometimes the best answer to a question is not a statement, but an opportunity to investigate. Later we shall see that when a three-year-old asked, "Do babies have teeth?," his teacher did not *give* him an answer. Instead, she had babies of different age visit the nursery school so that he could *find out* the answer for himself.

As encouragement and approval play a large part in children's learning, adults' reactions to their perception and concepts are also important.

Acceptance and Clarification Versus Ridicule of Young Children's Perception and Concepts

When a three-year-old nursery school child asked his teacher if a stableman they had visited was the horses' father, she did not reject this concept outright. Instead she explained that the stableman was *like* a father to the horses because he fed them and looked after them, but that only children had a man father, horses had a horse father.

Similarly when a four-year-old boy, looking at a picture of a withered European granny, asked "Why is she mad?," his teacher realized that what looked to her like crabbed age, to the boy looked merely crabbed. Therefore she explained accordingly.

Deriding perceptions based on limited experience and vocabulary may leave children with a feeling of impotence in organizing their impressions and a lack of confidence in themselves. This is an outcome recently dramatized in a stage play, "Hatful of Rain," in which a man's ineffectual adjustment to life is traced back to his early childhood and to an overbearing father who admonished him to work hard. To this the child responded by digging furiously in the mud during a

downpour, getting for his pains his father's derision, a hatful of rain, and—an enduring neurosis.

The concepts of an individual of any age become clearer when he attempts to express them; therefore young children are helped in clarifying their concepts by having available a variety of media in which they can express their ideas.

Opportunities to Relate and Integrate Observations in Dramatic Play and Other Creative Activities

A young child often has ideas which he cannot put in words. Thus, a nursery school child who impersonated a rabbit recorded his impressions of a rabbit in pantomime with greater skill than he could in words. Similarly a boy who symbolized the Christ Child, the Virgin Mary, and God in a painting suggested in brush strokes a concept of immortality that he could probably not have expressed in any other way. In experimental studies likewise young children often make successful judgments but cannot explain why they made them. The development of concepts is thus not a matter of rote learning. It is, in a sense, a matter of a word being made flesh.

Several studies indicate that young children have difficulty in mastering class concepts (Welch, 1940a,b,c,d). What kinds of experiences provide this practice?

Experiences Which Promote Concepts of Comparative Relationships

A variety of games of the lotto type which promote recognition of the class membership of objects, plants, and animals are one kind of experience suited to children from four years of age onward. A host of books contrasting activities that are hard and easy or animals that are big and small are another. So are puzzles which involve fitting parts to a whole. In addition, there is no limit to the games or puzzles of a bird, beast, fish, or fowl variety that an inventive adult can devise to make a child aware of common and contrasting characteristics and of comparative differences.

Concept formation is, therefore, aided by stimulating and channeling interest and curiosity, by fostering the child's ability to relate and compare, and by providing him with first-hand experiences that are within the range of his understanding.

Closely allied to perception as a symbolic process involved in the ordering and relating of sensory impressions is reasoning.

Can young children reason, and if so, how early is such ability apparent, and what form does it take?

Reasoning in Young Children

PIAGET reports on the basis of questions asked young Swiss children that the thinking of the young child is prelogical. What do we mean by logical thinking?

> A philosopher was visiting for the first time in the home of his two-year-old granddaughter. At their first meal together the little girl studied his bald head from the elevation of her high chair and then said to him in a friendly conversational tone, "You don't have to part your hair, do you?" The philosopher beamed. Here, as he said later, was a remark that went beyond mere observation and was not without tact.

> At a nursery school lunch table, the question of babies' teeth came up. Between mouthfuls of custard, John, aged three and a half, asked if babies had teeth. Custard eating was suspended while this problem received the consideration it deserved. Mary, with the conviction born of close observation of a two-month-old brother, said, "No, babies don't have teeth. Our baby doesn't have teeth." Here Martha, who has a nine-month-old sister at home, interrupted quickly, "My baby sister, Kathleen, has teeth." For a minute there was silence while Martha swallowed custard before enlarging on Kathleen's dentition. Four-year-old Dick's eye suddenly lighted, "I know, Martha," he said, "only babies called Kathleen have teeth." Martha beamed, and the entire group returned to the custard, completely satisfied with this masterly summing up of the situation.
>
> Actually, Dick had done very well with the information at his disposal. Unfortunately for the validity of his conclusion, he had no knowledge of the relationship between age and dentition. The validity of scientists' conclusions is similarly subject to their awareness of the factors involved.

Both of these episodes suggest that young children attempt to relate their observations and experiences. Let us see now what systematic studies disclose concerning young children's reasoning and problem solving. Representative of the many problems investigated are studies of infant responses to a string and lure presented under conditions of increasing perceptual complexity, and tests of young children's ability to make an exception and to apply a general solving principle. There are also studies comparing differences in adults and young children's approaches to problems.

Infant Adaptive Responses to a String and Lure Test

Using the string and lure situations shown in Figure 79, an investigator (Richardson, 1932, 1934) arranged the settings behind

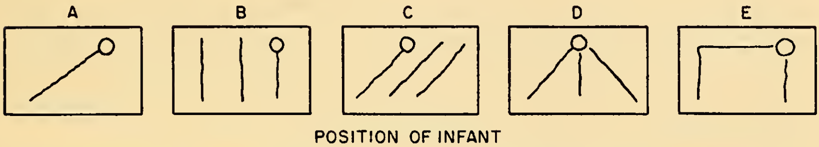

Figure 79. A series of string and lure tests. From H. M. Richardson, "The Growth of Adaptive Behavior in Infants," *Genet. Psychol. Monogr.*, 1932, *12*, 195–359.

a screen, then removed the screen and tapped the toy lure to attract the attention of the infant subjects. The responses of 10 boys and 6 girls tested at monthly intervals from 28 to 52 weeks of age were then classified into the five following types.

Success without insight

(a) interest in the string rather than the lure

(b) interest in the lure and apparently accidental contact with the string

Success with incomplete insight

(c) awareness of both lure and string without evident purposive utilization of the string

(d) experimentation

Success with insight

(e) definite utilization of the string as a means to bring lure into reach.

There was an increase with age in the percentage of "e" responses, and an increase with age in the complexity of string and lure situations the children responded to successfully.

Similar results were found later with a lever and lure situation. Nonverbal adaptive responses to nonverbal stimuli involving associative sensori-motor processes therefore develop in the first year of life. Such responses are in fact included in adaptive behavior test items in the Gesell Infant Development Schedule. Examples are "lifts cup by handle and secures concealed cube" (11 months) and "secures cube wrapped in paper" (12 months).

What of young children's ability to make an exception?

Making an Exception

In a test (Hazlitt, 1930) of the validity of Piaget's statement that young children cannot make an exception, 88 children aged 3 to 7 years were confronted with 3 problems. In one, a large blue egg containing a number of differently colored smaller ones was opened, and the child told to put back all except the green one. When a child failed to except the green egg, the experimenter said "but not the green egg." Several now responded correctly. The youngest to respond to "except" was 3.4 years of age.

In another test, children were asked to except cards with a moon and a star from those without a moon and a star. The youngest to respond correctly to this test was 4.8 years of age.

In a third test, colored and ornamented cards were mixed with black cards of the same size and some black cards of smaller size. Each child was told some cards were K cards and the experimenter called K as she put down the large black ones at the child's right. The other cards, including the small blacks, were silently laid at the child's left. The cards were then shuffled and each child asked to call K as the K cards were dealt.

Of the children who did this correctly, only bright children of 7 or 8 could say "All the black cards except the little ones are K."

In a later experiment, Hazlitt asked children to pick out a common object on each of four trays: in one series, a dog; in another, a match box. The youngest to respond successfully to the dog problem was 3.2 years of age. No child under 4 years solved the match box problem.

The child's ability to make an exception is therefore dependent on his ability to verbalize and on the complexity of the differentiation required.

Somewhat similar to the process involved in making an exception is that in deriving a general principle. Can young children derive and apply a general principle?

Applying a General Principle

In a test situation (Roberts, 1932) in which 43 children, 2–5 years old, were confronted by three colored doors, each with a colored aeroplane over it, the children were asked to open the door and "see if you can make the aeroplane fall." Opening the door that was the same color as the aeroplane over it always resulted in the aero-

plane falling, regardless of what color was involved. All 43 children eventually solved this problem, but no child under 3.5 years was able to verbalize the solution.

In another study of ability to generalize (Heidbreder, 1927, 1928), three tests were used, each of which involved learning which of two boxes contained a doll. In one test the doll was always in the right hand box, regardless of whether it was closer or farther away in successive trials. In another, the doll was always in the flowered box, never in the plain one with which it was paired, regardless of changes in their position in successive trials.

In a third test, boxes with plain figures and boxes with dotted figures were used. Two boxes of the same kind were used in each test. If the boxes used had plain figures, the doll was in the farther box. If the boxes had dotted figures, the doll was in the nearer box.

Of interest in connection with children's responses is the fact that the youngest ones who responded correctly could not always explain why they did what they did. No three-year-old, for instance, was able to give a satisfactory reason for selecting a given box, and only 5 per cent of the four-year-olds verbalized their solutions. Above the age of 6 years, almost every child gave an adequate verbal solution.

Young children's ability to generalize and to apply a given principle is thus dependent on the complexity of the problem. Children under three years of age demonstrate this ability in simple problems. They cannot, however, always verbalize a solution which they have successfully accomplished.

It is already clear that the ability to solve problems and the complexity of problems that can be solved increase with age. Also related to age is the child's ability to verbalize his successful solutions and to attack a problem as a problem rather than as activity for its own sake. Let us now consider some other developmental characteristics of young children's problem solving.

Developmental Characteristics of Young Children's Problem Solving

Acting Out Rather Than Thinking Out Hunches

Seventy-five children from 3 to 6 years of age and 40 adults were presented with the puzzle apparatus in Figure 80 (Harter, 1930). A grooved path with side alleys and a red hole at one end of the path contained three movable styluses, green, yellow, and red in

color. Each subject was told to put the red peg in the red hole. Then his overt responses and the time he took to complete the task were recorded. As can be seen, both the yellow and the green stylus had to be got out of the way. This could be accomplished by pushing them in an alley or putting the red stylus in an alley and then pushing

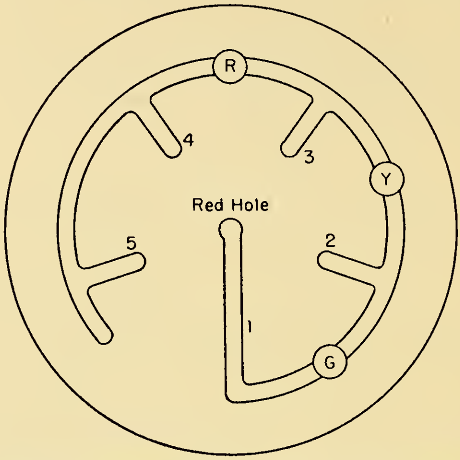

Figure 80. Obstacle peg test used to measure problem solving with or without overt trial and error. From G. L. Harter, "Overt Trial and Error in the Problem Solving of Preschool Children," *J. Genet. Psychol.*, 1930, *38*, 361–372.

the yellow and green to the dead end of the grooved path. Below are the average number of moves for the different age groups:

3 years	36.0
4 years	24.7
5 years	20.4
6 years	17.6

There is thus a progression with age in thinking through, rather than going through, the motions involved in solving a problem. At early developmental levels, thinking and acting appear to be simultaneous processes. This is what makes young children such destructive and dangerous household experimentalists. They tend to try out all their hunches letting the consequences fall where they will. They also apparently neglect to formulate hypotheses.

Neglecting to Formulate an Hypothesis

In a test (Hamilton, 1911, 1916) of the ability to formulate an hypothesis, children and adults were presented with an insoluble

problem. Confronted by four doors only one of which was unlocked, their problem was to determine which one. Actually the unlocked door, at any one trial, was a chance selection of the three doors which had been locked in the previous trial.

Under these circumstances, all subjects exhibited a variety of reactions, some of which the investigator considered more "logical" than others. Here are five methods of attack rated in terms of most to least logical:

A trying the three inferentially possible doors—avoiding the one previously unlocked.
B trying all 4 doors once each in an irregular order.
C trying all 4 doors once each in regular order, right to left or left to right.
D trying a given door more than once with intervening attempts to open some other door.
E repeated attempts to open a given door without intervening attempts at other doors, or persistent avoidance of a given door while avoiding all others.

An infant of 26 months exhibited: 15% A, 5% B, 20% C, 25% D, 35% E responses. With age there was an increase in A responses, a decrease in D and E; 76 to 85 per cent of adult reactions were the A type.

There is thus a developmental progression in the formulation of an hypothesis as a means of solving a problem. Actually this generalization is in essence very similar to the preceding one, as it reflects an early developmental tendency to act through rather than think through.

Other characteristics of young children's problem solving reflect their emotional immaturity and their dependence on adult help.

Failing to Observe Carefully, to Perservere, to Remain Calm, and to Vary the Solving Process

In a pilot study (Ling, B. C., 1946), eight children with superior mental test scores were placed in situations in which they could reach a toy lure by making use of various objects in the environment. In one test situation, for instance, a toy hung from the ceiling could be reached by bringing together a platform and an orange crate; in another, a toy outside a play pen could be pulled in by fitting together two hollow rods inside the pen.

Children's failures in these situations were attributed, by the experimenter, to such behavior as a lack of careful observation, lack of perseverance, fixity of solving process, lack of self-reliance, and excitability, all of them responses that handicap problem solving in individuals of all ages.

In summary, in early childhood there is a progressive development of the abilities involved in comparing, relating, making an exception, deriving general principles and applying them, and solving simple problems. Children's performance in tests involving these abilities is related to their intelligence test performance as well as to their chronological age. The dominance of motor behavior in early childhood leads to children acting out rather than thinking through their problems, and being sometimes unable to explain in words how they solved a problem in action. Their emotional immaturity and dependence on adults for assistance are likewise reflected in their giving up easily and calling for help when confronted by problems.

In discussing motor behavior, speech, and perception, implications from various studies suggested effective means of fostering these forms of behavior. Is it also possible to stimulate development of the ability to see relationships, to think logically, and to solve simple problems?

Here are some general procedures that seem warranted by the studies so far reported.

Procedures That Stimulate Development of the Ability to See Relationships, to Think Logically, and to Solve Simple Problems

Directing Attention to Relationships

The way in which experiences are presented determines in large measure the relationships which become apparent to the observer. Thus, a sequence of experiences in feeding different kinds of creatures directs attention to relationships between their size and their food intake (a pail of milk for a calf, a saucerful for a kitten) in a way less likely to occur in incidental and unrelated observations.

Evidence that the relationships a child can deduce are limited by his first-hand experiences is offered in the following story.

A second-grade teacher planned a temperance lesson for her young charges. She brought two worms to class, dropped one in a beaker with some water, the other in one with alcohol, and then held both up

for the children to see the quick and the dead. She asked, "What does this teach us?" There was a silence for a while, then one of the boys deduced, "It teaches us that if we drink alcohol we will never have worms."

Encouraging Consideration of Alternatives

Opportunities to make choices between alternative undertakings give a young child experience in balancing their respective merits—an essential element in problem solving. The free play situation that prevails in nursery schools offers many such opportunities to choose activities and roles in activity. Adults can often further consideration of these alternatives by reminding a child of an alternative he is overlooking. Thus to a child screaming for a blue truck already in use by a playmate, a quiet reminder "There is another truck in the shed" may suggest an alternative way of getting into the trucking business.

Fostering persistence

Success in problem solving calls for persistence as well as for a variety of approach. Persistence is fostered by experiencing its successful outcome. Therefore, young children need opportunities to succeed. In this connection a practice of the Navajo Indians is of interest. They encourage their children to learn how to hunt by occasionally putting a small creature in the traps for them. Thus, the children can savor the end result of hunting while still novices.

Children are similarly helped by some consistency in the circumstances of their lives, in, for example, parental reaction to different kinds of behavior. Such consistency makes it possible for them to predict outcomes.

Giving Logical Reasons for Rules of Conduct

Children are helped in arriving at notions of causality by the kind of reasons or explanations they are given for rules of conduct.

Recently in a nursery school, children were taking turns using the school's two watering cans to water the yard. At a point when the yard was fairly awash as a result of their efforts two boys picked up

the cans for their turn. A student teacher came over to them and said briskly, "Let's put the cans away. You've done enough watering." Here it was the yard, not the boys that had had enough watering. Similarly, many a statement beginning "We don't" could be replaced with a logical explanation of the danger or other undesirable outcome of a projected activity.

Children are also helped by having rules for their conduct progressively modified to keep pace with their developing ability to exercise judgment and take responsibility. Thus in a nursery school patio set up for art and construction activities, the younger group of children are required to comply with a rule of "no wheel toys in the patio" in order to prevent congestion. But for an older group capable of greater discrimination, this rule is modified to "no wheel toys in the patio when children are working there."

Encouraging Responses to Diminished Cues

Children are also helped in establishing meaningful links between associated circumstances by being encouraged to respond to cues rather than to depend on detailed directions. To illustrate: to a child dressing to go outdoors on a wet day, "Raining today, John," accompanied by a searching look at his feet calls for more interpretation and associative thinking than "Put your rubbers on."

Encouraging the Child to Seek the Source of a Difficulty

Similarly to a child fuming over a puzzle or a mechanical toy that won't work, a question that directs his attention to the source of his difficulty offers him more encouragement to think through his problem, than an adult's statement or demonstration of the solution.

Review

The perceptions of young children are modified by their immaturity. Their short attention span limits the number of sensory stimuli recorded. Further, their associative powers are capable of combining, relating, and synthesizing only one or two impressions. Perception of a complex of stimuli may therefore be based on one dominant stimulus which attracts the child because of his recent experience, interest, or emotional involvement. Perceptions and con-

cepts thus based on a very limited number of stimulus cues limit differentiation. Objects and experiences that are *similar* in one or two respects therefore tend to be regarded as the *same*.

Developmental progression is thus in terms of a lengthening attention span, and an increasing ability to synthesize impressions and to respond to an increasing range of the stimulus cues that are the sensory bases of the common concepts of our culture. Obviously such a progression is a matter partly of a maturing nervous system, partly of experience and training.

As for their ability to think logically, here also young children are handicapped by the immaturity apparent in their perceptual processes. Their lack of experience and their tendency to act out rather than think through or formulate their hunches in words result in their making a poor showing in tests of reasoning which involve verbal explanations of phenomena. In simple operational tests they demonstrate as early as three years of age some ability in applying generalizations, making exceptions, and solving simple problems. Their interest in causality appears to be related more to mental than to chronological age.

Recommended Readings

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Chapter 9

DEVELOPMENTAL FACTORS WITHIN THE ORGANISM

What are some forms of behavior that all infants develop regardless of their life circumstances?

How would the development of these forms of behavior seem best accounted for?

What evidence do we have in the general population of different rates in development of, for example, motor behavior?

Have we any evidence of differences in pattern or rhythm of development: spurts versus slow, steady development?

Are children consistent in rate and pattern in all aspects of their development?

What behavior of a young child would suggest his "readiness" to, for instance, learn to feed himself?

OBSERVATIONS BY SEVERAL psychologists (Gesell, 1929, Shirley, 1931, McGraw, 1943, Halverson, 1937) of what appear to be

general stages and sequences in young children's development of an erect posture, upright walking, and dexterity in manipulating objects led them to conclude that developmental factors within the organism are largely responsible for the inception of these behaviors. The term they coined for the operation of these factors is *maturation*.

The Concept of Maturation Versus That of Developmental Factors

MATURATION is, however, not an entirely satisfactory term because its definition by different psychologists does not make clear whether it applies to the operation of developmental factors within the organism or to the outcome of their functioning. Developmental factors can only function in interaction with an environment. Maturation as sometimes employed, therefore, appears to refer to the total *developmental process*, which obviously is a product of the interaction of developmental factors within the organism, learning processes, environmental circumstances, and inherited behavior capacities.

Consider for example the following statements.

"Growth is a process so intricate and so sensitive that there must be powerful stabilizing factors, intrinsic rather than extrinsic which preserve the balance of the total pattern and the direction of the growth trend. Maturation is in a sense a name for the regulatory mechanism" (Gesell, 1929).

"Maturation is a modification of the organismic pattern in response to stimuli present in the inter-cellular and intra-cellular environments which at the given moment are independent of external influences" (Marquis, 1930).

"To maturation must be added the concept of environment" (Kellogg, 1933).

"Maturation . . . includes any changes with age in the conditions of learning which depends *primarily* upon organic growth rather than upon prior practice or experience" (McGeoch, 1942).

"Maturation and learning are not different processes, merely different facets of the fundamental process of growth" (McGraw, 1943).

"As yet there are no architectural features in the nervous system which demarcate learning and maturation" (McGraw, 1946).

"Once the laws of development have been determined, the maturation concept may fade into insignificance" (McGraw, 1946).

". . . while maturation is a major factor in infant development, its importance lies chiefly in making learning possible. Maturation in

and of itself seldom produces new developmental items, but maturation of structures when accompanied by self directed activity leads to new infant responses" (Dennis, 1951).

These involved and wordy statements make it clear that maturation is an elusive concept. They also make clear the advisability of considering the interactive contributions to development of behavior that are made by learning processes, environmental experiences, and inherited behavior capacities, *as well as* by developmental factors within the organism.

Before, however, considering this interactive process, let us first review briefly the evidence from which the operation of developmental factors is inferred.

Inferential Evidence of the Operation of Developmental Factors

As OBSERVATION of sequences and stages in development of different forms of behavior first led to conjecture concerning developmental factors, let us begin by considering the nature of some of these sequences.

Sequences and Stages in Behavior That Occur Irrespective of the Environment of the Organism

In all animal species, the heart beat is the earliest recorded prenatal activity. In all species, three phases appear in the prenatal development of sensori-motor behavior. These are (a) a myogenic phase in which behavior can be elicited only by *direct muscle stimulation,* (b) a neuromotor phase in which *internal stimuli* acting upon the nervous system initiate behavior, and (c) a sensori-motor phase in which behavior is released through action of *stimuli from the environment.*

In the human species likewise the behavior of fetuses of different ages is so characteristic that an investigator (Hooker, 1952) was able to make accurate estimates of the ages[1] of fetuses from their behavior. As for postnatal behavior, the following sequences occur in the behavior of human infants regardless of their rate of development or their environmental circumstances.

Motor Sequence

Postural control develops first in the head and neck area, then in the shoulder and upper trunk, later in the lower trunk and finally in the legs.

[1] Age referred to here is menstrual age. See page 39.

In reaching for and manipulating objects, muscle control develops first in the shoulder and upper arm area, then in the forearm, finally in the wrists, hands, and fingers.

Preverbal Speech Sequence

In acquiring the sounds characteristic of adult speech all infants, regardless of the language they hear around them, show a similar progression in ratio of vowels to consonants and in use and understanding of inflections and gestures before using and understanding meaningful words.

Emotional Sequence

At birth, the only identifiable emotional states in infants are satisfaction and dissatisfaction. Gradually specific and identifiable patterns of emotional behavior are exhibited. As these develop in the blind as well as in the sighted, these patterns cannot have been learned.

That certain universally occurring stages in behavior are not learned has been demonstrated in animal species that can be experimented with in ways that human beings cannot. In one such experiment (Matthews, 1926), the animal studied was the salamander *Amblystoma* which goes through the stages recorded in Figure 81, in

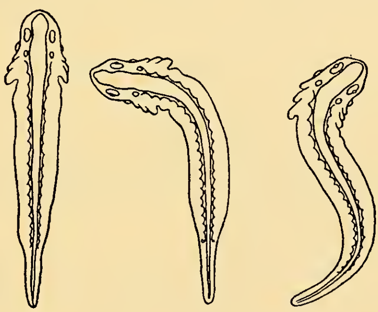

Figure 81. Three stages in development of swimming in the *Amblystoma.* From E. G. Coghill, *Anatomy and the Problem of Behavior.* New York: Macmillan Co., 1929, 7–8.

developing swimming movements. At a period before motility had begun, a large group of *Amblystoma* were divided into an experimental and a control group. The experimental group was placed in water containing an anesthetic chloretone. The control group was allowed to develop normally in water. Later, after swimming movements had developed in the control group, the inert anesthetized *Amblystoma* were placed in fresh water. In less than half an hour after their first sign of movement they could scarcely be distinguished from the control group, who had been free swimmers for five days. Thus it appears that behavior characteristic of a species *emerges* as a

result of developmental factors within the organism rather than a learning process.

In this particular species there is also evidence of a relationship between the stage of swimming development and the stage of development of the nervous system. It is, therefore, concluded that parallel development of structure and function is evidence of the operation of a common developmental factor or factors.

Parallel Development of Structure and Function

Other evidence of parallel development of structure and function is to be found in histological and morphological changes in the brains of human fetuses and infants which coincide with the emergence of certain kinds of behavior. Examples of such parallel relationships are as follows:

All neural pathways concerned with fundamental vital activities are myelinated by the end of the seventh month of prenatal life, a period at which a prematurely born infant is capable of breathing, sucking, swallowing, peristalsis, urination, and defecation.

Histological and morphological evidence of the immaturity of the cerebral cortex of newborn infants suggests that their behavior is for the most part mediated by subcortical areas of the brain. In keeping with this observation, behavior of the newborn exhibits such characteristics of lower brain functioning as reflex involuntary responses, some of which, such as swimming and supporting own weight, appear to have evolutionary origin.

Histological and morphological evidence of greater maturity of the cerebral cortex in later months of infancy suggests that it is becoming capable of mediating voluntary behavior and inhibiting some reflex involuntary behavior formerly mediated by the lower brain centers. As illustration that this actually occurs, involuntary swimming and grasping movements which can be elicited from newborn infants go through a period of disorganization (indicated in Figure 27, page 58) and are replaced by adaptive voluntary swimming and grasping. The period of disorganization is thought (McGraw, 1943) to coincide with the onset of cortical inhibition of lower brain functioning.

The cortical area most developed at birth is that which mediates movement of the upper trunk, shoulders, and arms—parts whose movement early comes under the infant's voluntary control.

Motor nerve fibres are myelinated before sensory fibres. In keep-

ing with this order of development, motor functioning is ahead of sensory functioning in the first weeks of life.

Myelination of neural pathways proceeds in a definite sequence which is also the order in which the pathways differentiated phylogenetically.

In keeping with the parallel development of neural structures and behavior, the sequences themselves exhibit characteristics that are best accounted for in terms of developmental factors within the organism.

Characteristics of Behavior Stages and Sequences Best Accounted for in Terms of Developmental Factors within the Organism

Direction of Development

One characteristic of motor development is that it follows an anterior-posterior, proximal-distal direction, sometimes referred to as the law of developmental direction. (See Figure 82.) Thus the infant

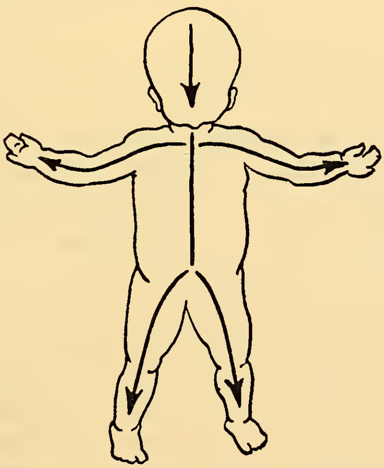

Figure 82. Direction of development of postural control and neuro-motor coordination during the first year of life.

moves his head before he sits up, and sits before he stands, and reaches before he grasps and handles objects. As the neural pathways which control these functions show the same order of development, it is logical to assume a relationship between such behavior characteristics and developmental factors within the organism.

Time Relationships Between Onset of Different Performances

Another characteristic of sequences of behavior in infancy is that time of onset for different performances is somewhat related. Thus, age of first walking correlates .39 with age of first talking (Bayley, 1935). A plausible explanation of this correlation is that the timing of onset of walking and talking is to some extent dependent on common developmental factors. Here again, the common component in performance would seem best explained in terms of developmental factors within the organism.

Dominance in Aspects of Development

A third characteristic is that in the early stages of development a single aspect sometimes *dominates* the others. Thus we see in the first weeks of life that sucking and mouth activity are so dominant that sucking responses may be obtained to a variety of unrelated stimuli. In the early stages of cell division and organ development, such dominance is also evident in metabolic activity gradients which result in some parts of the dividing cell mass developing more rapidly than others.

Critical periods in development

Closely related to dominance of function is the evidence of critical periods in the development of behavior, periods during which behavior is particularly sensitive to environmental circumstances. Such critical periods are also found in the development of structure. In the first three months of prenatal life, for instance, the fetus is sensitive to maternal infections in a way that it is not at a later period. Similarly in the transplanting of embryonic cells, at early stages of cell development, eye tissue cells transplanted into a mass of muscle tissue develop into muscle cells, at a later stage no matter where they are transplanted they maintain their individuality as eye tissue cells.

Just as cells and organs are particularly sensitive to environmental influences during the early stages of differentiation, so apparently is behavior. The evidence on this is, as we shall see later, tentative. It comes from reports of infants' responses to separation from their mothers (Spitz, 1946). The infants so separated were between six and nine months of age and hence at a period in their development when they were beginning to distinguish between familiar and unfamiliar persons, and to communicate with their familiar and ever present mother. When the mother was withdrawn for periods of several

weeks (for reasons that are not clearly set forth in the reports) and no substitute was offered in her place, the infants became grief stricken and socially withdrawn. What results would be obtained by withdrawing a younger or older child from his mother is of course a matter of conjecture.

Let us, therefore, consider some other evidence which compares infants' response to an experience in terms of their stage or phase of development. The comparison here is of the thumb sucking behavior of infants weaned early, late, and at an intermediate period (Bernstein, 1955). It was found that thumb sucking occurred most frequently in the early and the late weaned infants. There was the least thumb sucking in those weaned at intermediate periods. These group differences in response are explained in terms of "phase specificity." Those weaned in the early months of life when sucking is a dominant behavior characteristic responded to *frustration* of this drive with an increased and unsatisfied urge to suck. Those weaned late exhibited sucking behavior because prolonged *gratification* of a drive during its later less dominant phase tended to produce a habit of sucking.

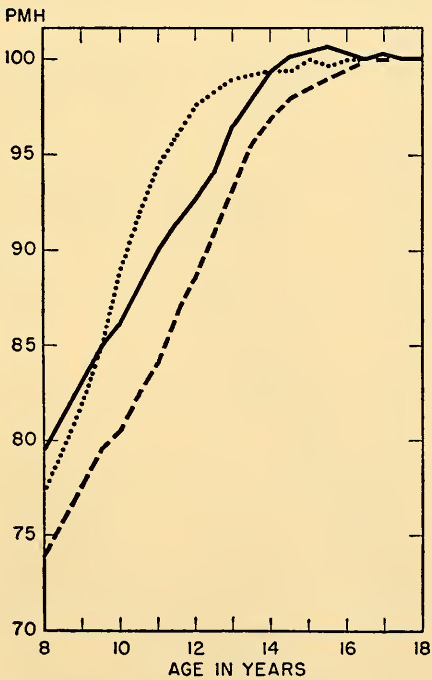

Figure 83. Percentage of mature height attained at succeeding ages by three girls, A, B, and C, developing at different rates. From N. Bayley, "Individual Patterns of Development," *Child Develpm.*, 1956, *27*, 45–74.

Other evidence which suggests the operation of developmental factors within the organism is to be found in individual rates and patterns of development which do not seem to have their origin in learning processes, inherited capacities, or environmental circumstances.

Individual Rates and Patterns of Development

Perhaps the most widely observed difference in rate of development is that in the onset of walking which may occur in infants at any age between nine and eighteen months. As there is no evidence that onset of this behavior is appreciably hastened by special practice, it must be attributed to developmental factors within the organism.

Individual differences in rhythm or pattern of development are also widely observed, particularly in growth in height. Thus some children attain adult stature by a growth spurt over a shorter period, others by a gradual steady increase over a longer period. Figure 83, which shows the percentage of their mature height attained by three girls, illustrates this difference in timing of development. If Figure 83 is compared with Figure 84, which shows the girls' actual heights,

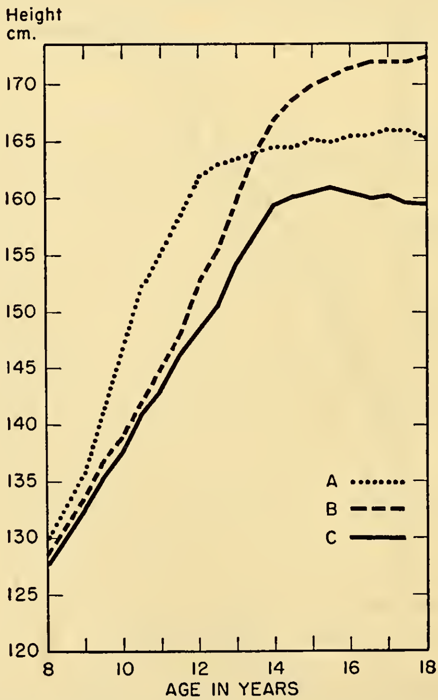

Figure 84. Height in centimeters at succeeding years of the girls A, B, and C, represented in Figure 83. From N. Bayley, "Individual Patterns of Development," *Child Develpm.*, 1956, *27*, 45–74.

it can be seen that comparing a girl with herself at different ages offers information concerning her developmental pattern that cannot be obtained by comparing her with other girls.

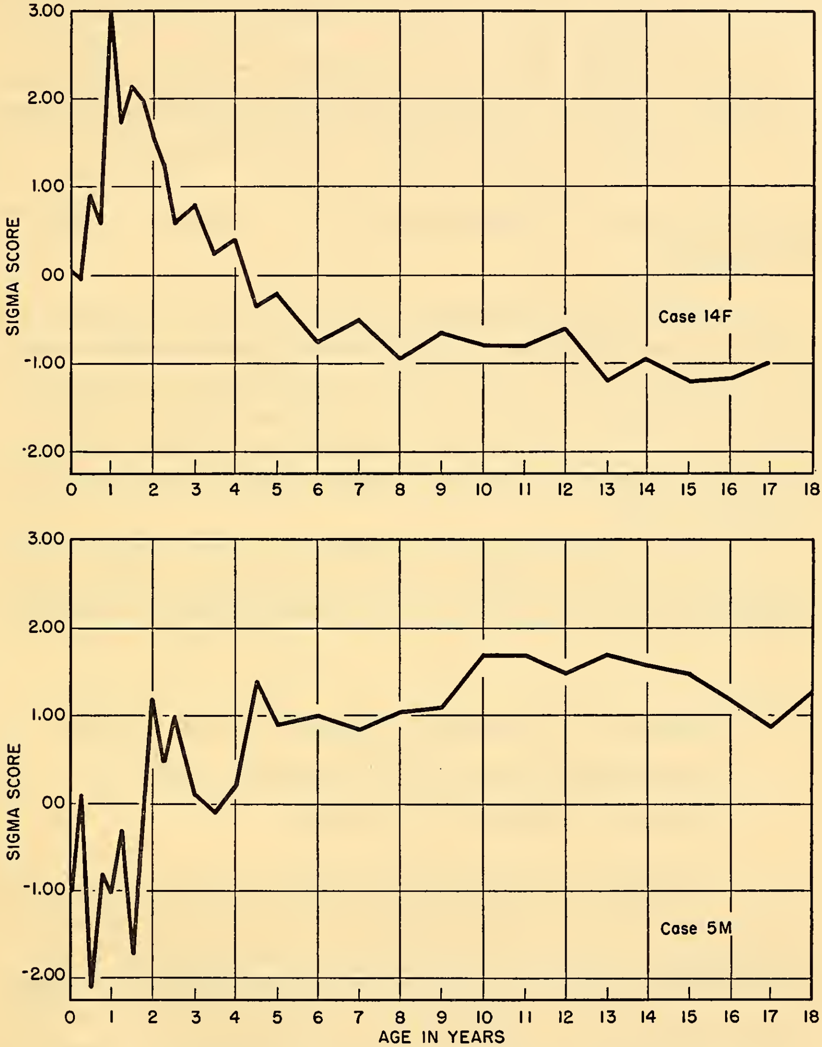

Figure 85. Standard scores on intelligence tests of two children over an eighteen-year period. From N. Bayley, "Individual Patterns of Development," *Child Develpm.*, 1956, *27*, 45–74.

Information concerning developmental rhythms can also be obtained by comparing a child's development at succeeding ages with that of a group of children. Thus, in Figure 85 intelligence test scores of two children have been converted into standard scores which are

a measure of each child's deviation from the mean of the group of children with whom he is being compared. The fluctuations in performance of these two children suggest contrasting patterns in development in mental test performance, with one child first accelerated and then retarded and the other first retarded and then accelerated relative to the group.[2]

Evidence of such individual patterns of development in a particular behavior raises the question of whether all aspects of development in a particular individual follow a consistent pattern.

Individual Patterns of Relationship Between Different Aspects of Development

In partial answer to this question, Figure 86 which compares two children's status at different ages relative to a group, on height, mental test, and motor test scores, suggests that patterns of relationship among these aspects of development are individual rather than general. Hence the limited usefulness of descriptions of behavior on an age basis and of attempts to determine a single index of development for a particular child.

As behavior is the outcome of inherited capacities, experiences, and learning processes as well as developmental factors, let us now consider how these influences interact in the development of behavior.

Interaction Between Developmental Factors, Learning Processes, Environment, and Inherited Behavior Capacities

Already we have seen that failure to take all of these influences into consideration in developing theories of behavior leads to conclusions that prove inadequate when submitted to test. As illustration, Piaget's early (1932) rigidly defined chronological-age stages in the development of thought and reasoning in young children omitted consideration of the part played by experiences, learning processes, and inherited behavior capacities. That this was an erroneous omission is now demonstrated in experimental studies (Oakes, 1946) which show that young children are capable, contrary to Piaget's contention, of giving causal explanations of natural phenomena when they can experiment, when they are interested, and when

[2] Later we shall note that developmental factors are not the *only* factors in fluctuations in intelligence test performances.

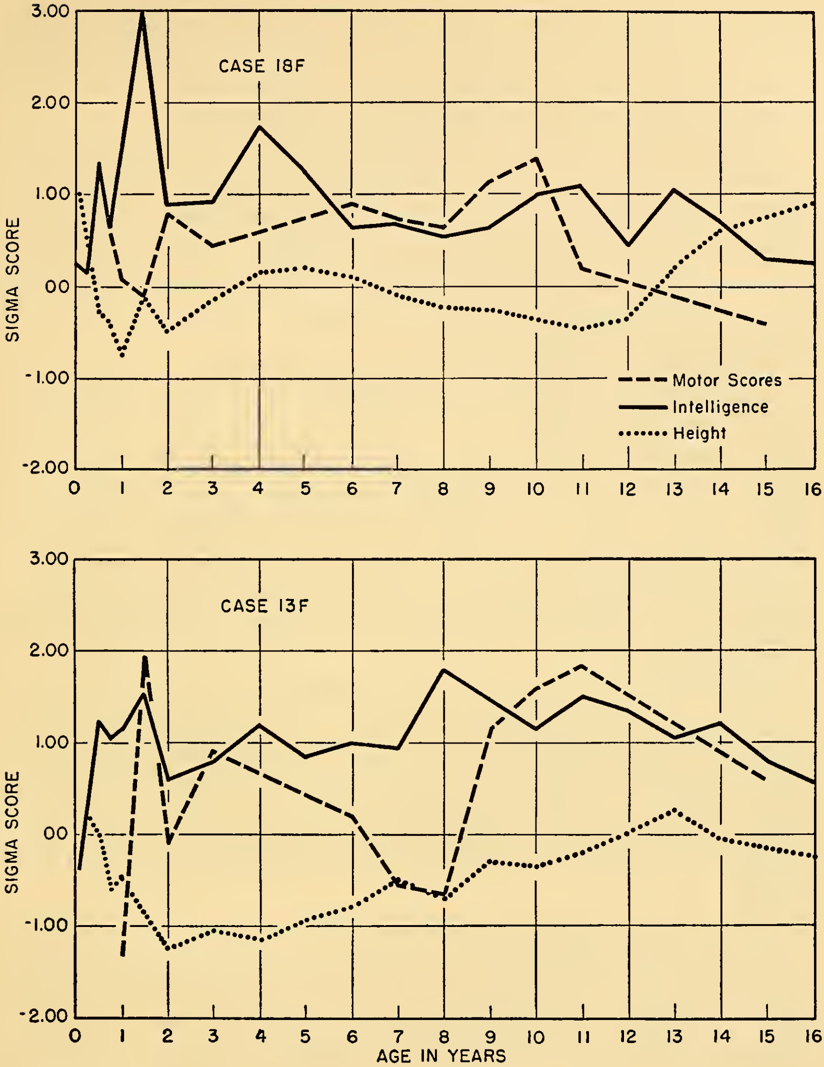

Figure 86. Standard scores on intelligence and motor tests, and height measurements of two children. From N. Bayley, "Individual Patterns of Development," *Child Develpm.*, 1956, *27*, 45–74.

the subject matter is within their understanding: in other words when they have the benefit of certain experiences.

In contrast, Piaget's later (1954) developmental analysis of the construction of reality in the child relates the influences of developmental factors and of experience with such observations as the following, "When prehension comes, the child *learns*[3] to follow with his hand objects which escape him and *thus begins* to attribute per-

[3] The italics are mine.

manence to tactile objects." In a somewhat similar analysis, another psychologist (Sarbin, 1952, 1954) describes the evolution of the self in terms of a child's maturing ability to distinguish self from non-self, persons from objects, and approval from disapproval.

Relationships between developmental factors, learning, and experience are similarly noted in a longitudinal study of children's behavior involving 116 normal children. In this study (Macfarlane, 1954), it was found that some behavior problems increased with age, some decreased, and some showed peaks at more than one age, suggesting that developmental factors probably contributed in some way to their incidence (Figure 87).

Negativism, for instance, was reported as a behavior problem in 20 per cent of the children at 21 months and in 30 per cent at three years. In contrast, lying, which requires greater verbal facility and hence maturity, was not reported as a problem in any child at 21 months and in only 15 per cent of the children at three years. Macfarlane refers to these behavior problems as coping devices or learned responses and suggests that they probably represent the most effective response to social pressures a child can master at a particular stage of development.

Inherited behavior capacities also affect the kind of coping devices a child can master. This is evident in a correlation of .58 between lying and intelligence test scores in three-year-old girls. No correlations of this magnitude were obtained at later ages, a fact that could be due to the more intelligent children developing more effective ways of coping with social pressures or becoming more convincing liars.

In another developmental study (Bayley, 1956), various measures of growth and behavior were obtained on a group of 61 children at succeeding ages from birth to 21 years. It was found that children whose intelligence test performance was relatively low at 21 years had gained their growth in test score earlier and tended to level off, while those whose score at 21 years was relatively higher had shown progressive gains throughout the 21-year period.

This summary of inferential evidence concerning the operation of developmental factors gives some indications of how they function, but little clue to their nature. What are they?

Probable Nature of Developmental Factors

Developmental factors appear to be what make an acorn grow into an oak and a fertilized human sex cell into an adult when

each is given a suitable environment. Therefore, they must represent stored or potential energy in some form. Further, as human characteristics appear to be determined by more than one gene, and as single

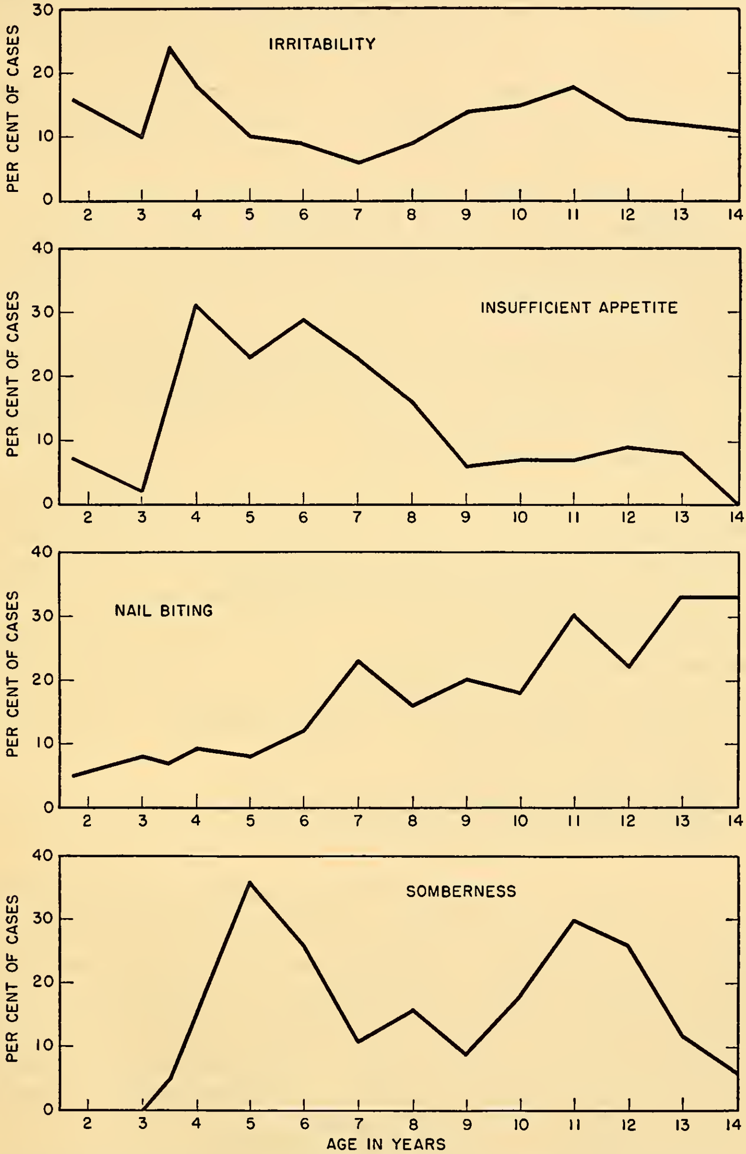

Figure 87. Behavior problems which show peaks of incidence at different ages. From J. W. Macfarlane, et al., *A Developmental Study of the Behavior Problems of Normal Children Between Twenty-one Months and Fourteen Years.* University of California Publications in Child Development, 1954. University of California Press.

genes appear to contribute to the determination of more than one characteristic, it is reasonable to assume that a number of factors are operating in an interactive way. As for the phenomena of dominance in aspects of development, this suggests either some type of gradient in their activity or some system of reciprocal checks and balances such as appears to occur in the functioning of the endocrine glands.

The preliminary nature of this formulation reflects our present meager understanding of intracellular and intercellular activity in an organism. The future expansion of our understanding probably lies more in the field of biochemistry than in that of psychology.

Meanwhile the concept of developmental factors, however preliminary in formulation, holds practical implications for those who work with young children. It suggests that how a child behaves is in part dependent on his level of development. Such statements as "He's only a baby" or "He acts his age" thus reflect understanding of the internal checks that set limits to what can be expected of a child at a particular stage of development. By way of contrast, consider two epitaphs of the seventeenth century.

To Amy, aged 6:

"*Who ever saw such matron looks, such smiles,*
Such speaking actions, woman childish wiles,
To make herself disport."

To Joseph Barker (aged 10 years):

"*One that at nine was aged, and before*
Ten came, extolled some who had been fourscore
We knew him wittie, mild,
Active, discrete, a man's heart in a child
Whom Nature only made, that men might see
And read themselves in an Epitome."

The concept of developmental factors resulting in different rates and patterns of development also suggests that each child is developmentally a law to himself. Therefore, we should not expect of one eighteen- or twenty-four-months-old child what another can do. This is well illustrated in the film, "From Creeping to Walking" (Gesell), which shows a boy and a girl of the same chronological age developing at different rates in different aspects of behavior. One is ahead on creeping, the other on standing and manipulating.

Perhaps the most useful implication in the functioning of developmental factors is that children's emerging performances and their evident urge to practice them, suggest the kind of experience they are "ready" for. Selecting play materials for a three-year-old boy is thus a

matter of observing the behavior of the particular boy, and gauging what *he* seems ready for. If he has an urge to jump and his parents have an urge to preserve the innersprings of their bed or sofa, a bouncing board or canvas will give such a child a chance to do what he wants in a way his parents can accept.

Review

The development of behavior in early childhood is in part dependent on developmental factors within the organism. The functioning of these factors is inferred from observed sequences and stages in infant behavior that occur universally and are unaffected by infants' environmental circumstances or their rates of development. Their functioning is also inferred from observed changes in behavior that are paralleled by morphological and histological changes in the central nervous system, and from characteristics of behavior stages and sequences that are best accounted for in terms of developmental factors within the organism. Such characteristics include direction of development, interrelationships between different aspects of development, dominance and critical periods in development, and individual rates and patterns of development. Though we have only a limited concept of the nature of developmental factors, evidence of their functioning has practical implications for understanding and guiding young children's behavior in terms of each child's pattern of development.

Recommended Reading

Readings in Child Psychology, edited by Wayne Dennis (New York: Prentice-Hall, 1951): pp. 104–31, Dennis, W., and M. G. Dennis, "Development under controlled environmental conditions" (A description of the phases by which coordinated behaviors present at birth—specifically, grasp suspension and swimming reflexes—first become more pronounced, then deteriorate and are replaced by voluntary grasping and swimming. The phases are related to the growth of the central cortex which, it is presumed, inhibits reflex responses mediated by lower brain centers.); pp. 145–52, McGraw, M. B., "Influence of cortical development upon early behavior patterns" (A report of the development of fraternal twin girls who were reared under controlled environmental conditions, which offered restricted social stimulation and little opportunity to practice sensori-motor performances.).

Recommended Films

"Thirty-six weeks behavior day." Sound, 10 mins.
Encyclopedia Britannica in collaboration with Dr. Arnold Gesell.

"Behavior patterns at one year." Sound, 10 mins.
Encyclopedia Britannica in collaboration with Dr. Arnold Gesell.

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Chapter 10

LEARNING PROCESSES

What are young children in our society required to learn?

What circumstances would be likely to promote learning of acceptable social behavior?

Are there differences in the way a child learns to be afraid of men in white coats, to ride a tricycle, and how to reach something on a high shelf?

What are the effects of mild and harsh frustration on learning?

How can a conditioned response be erased?

AT BIRTH, as we have seen in Chapter III, the human infant has a limited behavior repertoire. He is particularly limited in the type of adaptive responses he can make to environmental stimuli. His subsequent behavior at two, three, and later years of age is therefore partly the result of learning. Learning, in turn is made possible by his reaching the level of maturity at which each particular learned act or response is possible.

How *do* young children learn? They learn so many different kinds of things: to ride a tricycle, to repeat nursery rhymes or radio jingles, to be wary of men in white coats after their first innoculation, to figure out how to reach interesting objects "safely" put away, and to "mind" mother. No one explanation, therefore, satisfactorily accounts for sensori-motor learning, rote learning, learning to discriminate and to solve problems, and learning habits and attitudes.

This does not mean that such explanations have not been attempted. Before considering them, however, it will be helpful to define learning. Here are some definitions formulated by investigators:

McGeoch (1942): "learning represents a change in performance as a function of practice. In most cases if not all this change has a direction which satisfies the current motivating conditions."

Munn (1954): "learning may be said to occur whenever behavior undergoes incremental modifications of a more or less permanent nature as a result of activity, special training or observation."

Hilgard (1952): "learning is the process by which an activity originates or is changed through training procedures (whether in a laboratory or natural environment) as distinguished from factors not attributable to training."

All three definitions agree in describing learning as *a process in which a change in performance or behavior results from training, practice, or observation.*

How is this change brought about? Examples have already been offered of responses learned as a result of conditioning (*conditioned responses*), as a result of self-initiated activity (*autogenous responses*), as a result of social stimulation or direction (*sociogenous responses*), and as a result of seeing a relationship or reorganizing perceptions (*insightful responses*). Later, we shall see that there is also some learning simply as a result of repeated exposure to a stimulus or set of stimuli. Such learning is currently referred to as *latent or incidental learning*. Actually these different kinds of learning are not completely dissimilar. Some of the same circumstances or factors play a part in all of them. Therefore, before we attempt to reach any conclusions as to the nature of learning processes, let us review what is known of the circumstances or conditions that have been found to be associated with learning in early childhood.

Circumstances or Conditions Associated with Learning in Early Childhood

Readiness for Learning

We have already noted that the motor skills a child can learn are limited by his level of anatomical and neurological development. McGraw (page 104) found it impossible to teach Johnny to

tricycle at eleven months of age, and recorded no improvement with practice until he reached nineteen months of age. Hilgard (page 104) found her two-year-old subjects made greater progress in climbing toward the end of their twelve-week period of practice when they were more mature.

That "readiness" is not confined to the learning of motor skills is indicated in a recent interpretive description of the "construction of reality" in infants during their first eighteen months of life. Piaget (1954), you will recall, observed three infants' responses, at succeeding ages, to objects which were moved, dropped, hidden behind a screen, or partially exposed. He noted that *until* the infants were able to look for and reach for and grasp an object they acted as though it ceased to exist when it was moved out of sight.

In somewhat similar vein a social psychologist's (Sarbin, 1954) description of the child's evolution of a concept of self is in terms of the child's maturing ability to differentiate self from non-self, agents from objects, and persons from objects. What the child is *ready to learn* about himself and his environment is thus dependent on his ability to distinguish between, relate, and interpret the stimuli he receives from his sensory organs.

Association of a Neutral Stimulus with One Which Produces a Biological Response

The earliest examples of learning in infants are those in which a neutral stimulus was experimentally associated with one which elicits a specific response. Thus, Marquis (page 61), working with newborn infants, found she could condition a sucking response to the sound of a buzzer if the buzzer were sounded a few seconds before a nipple was placed in a hungry infant's mouth. Similarly Spelt (1948), working with unborn fetuses, found he could condition a vigorous movement response to tactile vibration of the mother's abdomen if tactile vibration immediately preceded a sound stimulus.

The number of repetitions of associated stimulation required to produce a conditioned response varies for different subjects and for different stimulating conditions. In newborn infants, for instance, some conditioned responses were obtained only after several repetitions of associated stimulation (Wenger, 1936). In contrast, an eighteen-months-old child developed a fear of the barber's shop as the result of a single experience (page 189).

In other experiments, you will recall that stimuli *similar* to the one which elicited a conditioned response also had the same effect. Thus,

a fifteen-months-old infant (Jones, page 184) who heard a buzzer sounded a few seconds before he received a mild electric shock, developed a withdrawal response not only to the buzzer but to similar sounds, such as those of an electric bell. This *generalizing* of the experimentally produced conditioned response is not its only distinctive feature. It can be extinguished by associating the conditioned stimulus with a stimulus which produces an opposite response from that given to the conditioned stimulus. Thus in Watson's experiment a fear response was first conditioned in an eighteen-months-old child by associating a rabbit's appearance with a sudden loud sound. Later this response was extinguished and the child reconditioned by associating the rabbit's appearance with a pleasant meal hour.

Of course the conditioned type of learning often occurs in natural as opposed to laboratory situations. Otherwise how could we explain a young child's fear of men in white coats following his first innoculation? In such natural situations, conditioning may take place as the result of a single experience with the associated stimulating conditions, provided the stimulus with which the neutral stimulus is associated produces strong emotion.

Many conditioned responses thus have their basis in feeling or emotion rather than in knowing or understanding. It is, therefore, not surprising that ease of conditioning and generalization of conditioned responses have been found to be related to personality characteristics. As noted earlier, anxious people seem to develop conditioned responses more readily than the non-anxious, and they show greater generalization of such responses (Hilgard, 1951, Spence, 1953, Taylor, 1951). This suggests that if we want to understand emotional responses which probably result from a conditioning process, we should analyze the circumstances under which the response originated. This is what was done in the case of the child who had become negatively "conditioned" to the barber's shop (page 189). This also suggests that we should examine the associations we foster in children's minds by the values we attach to objects or activities. What attitudes, for instance, is a child likely to develop to going to bed if he is punished by being put to bed, and what attitudes is he likely to develop toward eating desserts and vegetables if dessert is made a reward for, presumably, struggling through some vegetables?

What makes the conditioning process (and the associated phenomena of generalization, discrimination, and extinction) particularly interesting to some one interested in young children is that it accounts so well for the development of much of their behavior—their first words, their fears and feelings about persons and places, and some of their habits.

Repetition of Activity or of Observation of Associated Stimuli

Repetition is a necessary feature not only of the experimental conditioning process, but also of other learning situations. The child who is just beginning to walk or to manipulate objects practices endlessly. One psychologist (Dennis, 1951) refers to this self-initiated repetitive activity, which results in improved performance, as autogenous. He states "practically all of the common responses of the first year of life may be developed autogenously. That is, infants will develop these responses without encouragement or instruction, without reward or example. In the development of the autogenous responses of the first year, learning plays an important part."

Nor is it only in the learning of skills that repetition plays a part. Perceptual learning also requires repeated observations. It is on this basis that Piaget infers the infant's "construction of reality." Further evidence of the part played in perceptual responses by repeated association of sensory stimuli comes from studies of adults who recovered their sight after being blind from birth (Senden, 1932). When vision was restored, it was some time before these adults could successfully differentiate objects. Though they could immediately distinguish between a ball and a block as visual objects and, with their eyes shut, between a ball and a block as felt objects, they had to learn to associate perceptions of these two types: that is, they had to learn the visual appearance of an object that felt round. Repeated experiences of looking and feeling were required before they developed these concepts. This fact suggests that a young child does a staggering amount of learning during the first years of life.

Simply repeating a performance or an observation has, however, limitations as far as learning is concerned. Evidence of its diminishing returns was offered in a study (Hicks, page 110) in which children who were initially less practiced (girls vs. boys, younger vs. older children) made greater gains with practice in throwing a ball at a moving target.

In this connection it is worth noting that though children learn by doing, what they learn is what they are doing. Hence the need for scrutinizing repetitive training experiences to which children are subjected, such as being sent from the table to wash their hands day after day in order to teach them to wash before eating. Under these circumstances what a child is likely to learn is to come dirty-handed to the family board and *then*, under maternal admonition, retire to wash his hands.

Evidence is also available that the benefits of repeating an activity or observation are dependent on the attention and involvement of the performer. Thus, in a study (Stevenson, 1954) in which children were motivated to find a key to open a box and get a reward, it was found in later tests that their knowledge of irrelevant objects placed with the key depended upon the spatial relationship between the objects and the key. The children learned more about an object if the key were inside it and they had to open it to get the key. This suggests that incidental learning is less effective than intentional learning.

What makes studies of incidental learning, such as this one, of interest is that a great deal of what young children learn is incidental rather than intentional. They are learning all the time and what they learn to associate in their minds is what is associated in their experience. For this reason, in nursery schools play equipment is presented in a way that suggests its constructive use. Books are in a book rack alongside a table and chairs, which suggests that books are looked at rather than carried around in a wagon or used for building material.

Perception of Relationship or Reorganizing of Perceptions

In contrast to learning in which a child's later responses represent progressive modification of his initial response is learning which results from the child's perceiving a relationship between a set of circumstances.

It is in this learning process that young children appear to differ most from adults. When they are confronted by experimental problems whose solving involves their manipulation of such objectively unrelated objects as boxes, stools and sticks to reach a toy or banana suspended from the ceiling (Alpert, 1928, Ling, 1946), they tend to exhibit the following characteristics. They *try out* all their hunches, thereby exhibiting more overt trial and error than is true of older children. Presumably they do this because they are developmentally less capable of a long attention span, and because they lack the experience which would indicate the possible relevance of the various elements in a problem situation. They also fail to vary their solving principle, fruitlessly waving a stick at the inaccessible lure and thereby exhibiting a lack of plasticity in their perception. Finally, they fail to persevere, again possibly because they are more concerned with the immediate present and with immediate gratification.

This descriptive account of young children's behavior in a problem situation must be accepted with the reservation that young

children may have goals and purposes that are different from those of adult experimenters. We have already noted that young children enjoy activity for its own sake. It is, therefore, possible that differences in insightful learning in young children and adults are partly due to differences in motivation and experience.

As much of what young children learn is in response to social stimulation, let us now consider the effectiveness of different kinds of social stimulation.

Demonstration, Direction, Encouragement and Reward

Demonstration

The effectiveness of demonstration is recorded in an old folk tale about a man who tried everything he could think of to get a group of monkeys to throw caps they had taken from him on the ground. Finally, in sheer exasperation he flung his own cap on the ground, and lo, all the monkeys did the same. Turning to evidence of a more substantial nature, you will recall that children who associated mainly with adults had a larger average speech response than those who associated with their age peers. This suggests that the kind of behavior model, or the quality of demonstration given children, influences what they learn.

Other evidence of the efficacy of different *types* of demonstration was offered in comparisons of children's performance in copying placement of a ring on one of several pegs on an easel. When the training demonstration was made on an easel alongside the child's, he did much better than when it was made on one at right angles to or opposite his (Emerson, page 113).

The kind of relationship a child has with the demonstrator also influences the learning that takes place. This is illustrated in studies which suggest that some social behavior in young children results from their identifying with their like sex parent. For example, comparisons of doll play in standard doll play sessions revealed that boys whose fathers were present in their homes were more aggressive than those whose fathers were not present (Sears, 1946). No such relationship, however, was found for girls, presumably because girls do not identify with their male parent. (See Figure 88.)

This study of Sears suggests that when children identify with an adult they learn to do what *he does* as well as what he tells them to do. In this connection, consider what happens when an adult takes a supposedly therapeutic snap at a three-year-old biter to let him know

how it feels to be bitten. What does the biter learn, aside from the fact that he could get a better grip on his friends if his dentition were more advanced? Consider too what happens when a four-year-old boy is spanked by his father for hitting a younger sister. On the one hand he is punished for physical aggression; on the other, a model

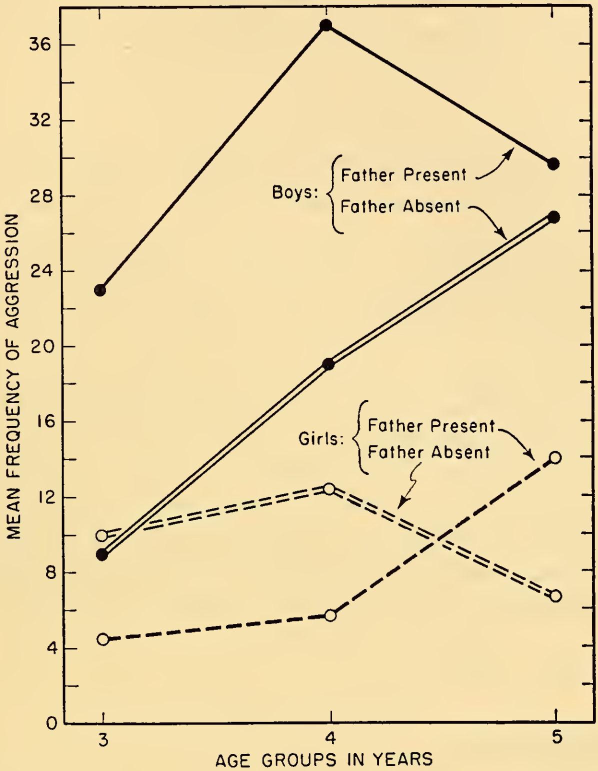

Figure 88. Doll-play aggression of girls and boys with fathers present or not present in their homes. From R. R. Sears, et al., "Effect of Father Separation on Preschool Children's Doll Play Aggression," *Child Develpm.*, 1946, *17*, 219–243.

of physical aggression is set for him by the person he loves most and seeks to imitate and identify with. What does he learn from this? Presumably not to eschew physical aggression, but to employ it when he can get away with it.

In trying to get a young child to learn to do what adults want, verbal directions play a large part.

Directions

In a comparison of children's progress in learning to toss rings over a peg under different practice conditions (Goodenough, page 112),

children who received instructions and criticisms of their performance made better progress than those who were merely awarded stickers for making a ringer.

Apparently the children were helped by being told what they were to note and learn. Somewhat similar evidence of the value of having words for what is to be noted and learned comes from the study in which children learned which of five mounds a toy was hidden under (Pyles, page 163). You will recall that in one test the mounds were all the same shape and unnamed, in another the mounds were the same shape but were given nonsense names, and in a third the mounds each had the shape of a familiar animal. In the third test the children spontaneously referred to the mounds by name, and in it they did very much better in learning which of the mounds the toy was hidden under. A later study (Schaeffer, 1955) makes it clear that the unique function of words, names, or terms is in focusing children's attention on *the significant stimulus.*

The quality of directions is therefore important. You will recall that children learning a motor skill did better when given positive, specific, unhurrying, encouraging suggestions than when given general negative, hurrying, discouraging ones (McClure, page 207). The value of clear statement of what is to be learned was also evident in Macfarlane's study of behavior problems. She found significant negative correlations between the mother's effective use of language and the incidence of nail-biting, temper tantrums, and irritability in her children.

Encouragement

Encouragement also usually facilitates learning. In a study in which children learned to respond more constructively to failure, the investigator (Kiester, page 201) encouraged the children, during a training session, with such remarks as "That was fine." "You are learning to try hard and not have anyone help you." "You did it all by yourself." "Good for you." While these encouraging remarks were being made the children were progressing successfully through a series of problems graded in difficulty, an experience that was in itself encouraging.

This study suggests that the more difficult the task, the greater the need of encouragement. Therefore it is especially necessary in working with handicapped children, such as those suffering from cerebral palsy. These children laboriously acquire motor coordinations that the unhandicapped develop with much less effort. Hence

such coordinations as controlling tongue and eyeball movements deserve encouragement and reward.

How can this be given? In developing control of his tongue muscles in practice sessions, a child can have a life saver held in front of his mouth so that he gets a rewarding lick each time he pokes his tongue out. In developing control of his eyeball muscles in practice sessions he can have something interesting to follow with his eyes, such as a brightly colored electric toy train racing round a circular track.

Helen Keller would never have developed the ability to communicate her thoughts in words without the affectionate encouragement she received from her devoted teacher and companion. Children handicapped in their emotional adjustment need similar support. Hence, Anna Freud allies herself with her young patients in therapy in a way she does not with her adult ones, giving them direct support and encouragement throughout the entire period of therapy.

Entertaining and somewhat moving evidence of the part played in learning by encouragement and affection, combined with stimulating circumstances, is offered in a film, "Comparative tests on a human and a chimpanzee infant." This film shows the behavior developed by a chimpanzee who was brought up with a human infant and given the same encouragement and affection as her human companion. As a result, she far outdid behavior expectations for her species. A whole series of studies of superior learning in young animals under conditions in which they were given human attention (Bernstein, 1952, Hebb, 1947) similarly suggests that encouragement, interest, or affection is a powerful stimulus to learning.

This takes us from consideration of how children learn to why they learn; from discussion of what is observed to what is inferred. But how can we develop inferences, hunches, or speculations concerning why children learn what they do? One approach is through analyzing what they learn.

Motivation of Learning

In all of the instances cited above, children's learning appeared to serve the purpose of satisfying some need, drive, or desire.

Gratification of Desire or Avoidance of Unpleasant Consequences

The hungry infants who learned to suck in response to the sound of a buzzer which had been associated with putting a nipple in their

mouths were making an anticipatory response that in their past experience had led to satisfying their hunger. Similarly, infants who endlessly practice walking and manipulatory skills seem to be satisfying an urge to put emerging abilities into practice. As for their learning in response to social stimulation, it seems likely that they learn in order to win adult approval and affection. In the child's helpless dependent state he needs adult approval and affection in order to achieve many of his goals or to avoid unpleasant consequences.

Two psychologists (Miller and Dollard, 1941) have summed up the learning process in terms of wanting something, attending to something, doing something, and receiving something. Another (Freud, 1952) has described the basic factors in a young child's social learning as "fear of loss of love, and fear of punishment." As it is difficult to conceive of *some* young children having a fear of punishment when they have so little first-hand experience, let us now consider the nature and source of young children's desires or drives for gratification.

Primary and Secondary Drives

At birth the infant's drives, wants, or desires appear extremely simple. He gives evidence of wanting to be fed when hungry, to be kept warm and fairly closely wrapped, to be gently handled and given some changes of position, and to rest undisturbed by sudden or intense stimuli. By three or four years of age his wants have greatly expanded as a result of his maturing abilities and his experiences. He has learned to want parental attention and affection, partly because they have become associated with satisfying his basic needs for food, care, and protection. He has also learned the pleasures of independence as a result of his maturing ability to move and manipulate, to differentiate and decide. It is thus possible to distinguish between primary drives present at birth and secondary or learned drives. It is also possible to get some idea of the strength of a child's drives by the magnitude of his efforts to satisfy them. We infer therefore that whatever strengthens a drive may increase learning, and many investigations have been devoted directly or indirectly to testing this hypothesis.

Whetting Effect of Mild Frustration

What they seem to prove is that a *mild* amount of frustration tends to whet a child's desire or strengthen his drive. Thus Sears (1953) studied parents' punitiveness and young children's aggressive behavior in nursery school and in projective doll-play sessions. He found that a mild degree of parental punitiveness increased aggres-

sive behavior both in the nursery school and in projective doll-play sessions (see Figure 89). Sears interprets this as indicating that mild punishment offers a mild degree of frustration to aggressiveness and hence increases it. High or extreme parental punitiveness reduced aggressiveness in school, but increased fantasy aggression in the pro-

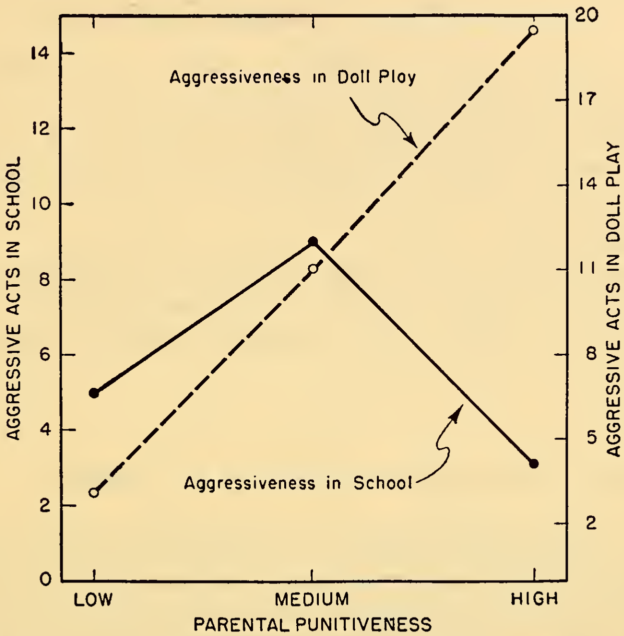

Figure 89. Relationship between parental punitiveness and children's aggressiveness. From R. R. Sears, "Relation of Aggressiveness to Punitiveness of the Home," *Amer. Psychol.*, 1951, *6*, 476–483.

jective doll-play sessions. In this case children's aggressiveness was, figuratively speaking, driven underground.

Evidence from other studies supports the suggested relationship between moderate frustration and increased drive. Thus, in a study of two-child families (Koch, 1955), whenever a child's sibling was, by virtue of age or sex, a competitor for maternal attention, the child made more effect to ingratiate himself with adults in a position of authority, thus generalizing his response to his mother.

In another well-designed experiment (Gewirtz, 1956), children were found to make more bids for attention when this attention was less available. Thus, when brought into a playroom and invited to paint at an easel, they made more bids for the experimenter's attention when he was working at a desk at some distance from them than when

he was sitting alongside them. This is a phenomenon with which all mothers of young children are very familiar.

Just as mild frustration *whets* a drive, consistent repeated reward of drive-directed behavior perpetuates or *sets* the rewarded pattern of behavior.

Setting Effect on Behavior of Consistent Repeated Reward

We noted in an earlier chapter that there was more thumb sucking in early- and late-weaned infants than in infants weaned at an intermediate period (Bernstein, 1955). This behavior was explained in terms of mild frustration whetting a drive and thereby augmenting effort whereas prolonged gratification set a pattern of response or established a habit.

These postulated mechanisms of whetting and setting imply that learning involves energy or power of some sort. Hence it is not surprising that psychologists have speculated about the source of this energy.

Speculation About Source of Energy in Learning

Freud called it libido and regarded it as the motor of human behavior. Another psychologist, Lewin (see page 358), described behavior as always involving interaction between a person and his environment. He suggested, therefore, that objects in an individual's environment may exert forces or have powers of attraction or repulsion for him. To illustrate their action, a child wishing to retrieve his toy swan from the advancing waves on the shore is attracted by the swan and repelled by the waves. He is thus in a field of forces in which the positive and negative forces exerted by the swan and the waves determine what he *learns* to do. (See Figure 90.)

Neurological Basis of Learning

As for the neurological basis of learning, we know that development of the cerebral cortex parallels development of behavior. We also have evidence that brain injury in infancy, *of some kinds*, impairs learning *of some kinds* in a way that injury in adulthood does not. This may be due, as Hebb (1949) suggests, to adults having established neurological patterns of response which continue to function even when brain area is reduced.

In brief, our knowledge of the neurological basis of learning is limited. Nor do we understand all the interrelations between an individual and his environment, let alone how these interrelations affect what he learns. Even so, what we do know has practical utility. This is

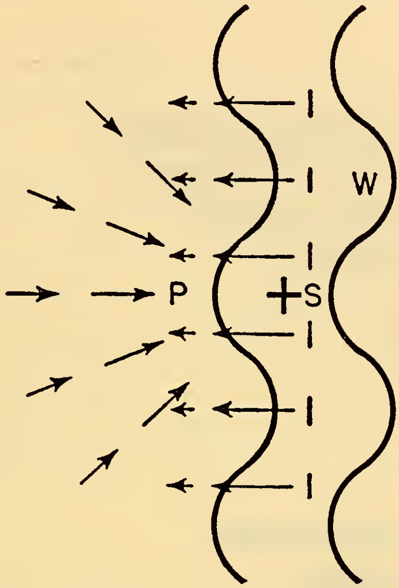

Figure 90. Child confronted by an attractive toy swan (S) floating on advancing waves (W) is represented in a field of opposing forces of attraction and repulsion. From K. Lewin, *Dynamic Theory of Personality*. McGraw-Hill Book Co., 1935.

evident in a descriptive summary of the contacts of good nursery school teachers with three-year-old children:

> Teachers told the children what to do rather than what not to do, they demonstrated activities, they gave encouragement and approval, they offered information and asked questions to stimulate thinking, they gave the children physical assistance when necessary for their undertaking and they used physical guidance to give the children the kinesthetic experience necessary for their learning of new motor skills. [See Figure ninety-one.]

Review

LEARNING is said to occur whenever a change in performance or behavior results from training, practice, or observation. There are different kinds of learned responses: conditioned responses, autogenous responses, sociogenous responses, insightful and incidental

responses. Because we can distinguish different kinds of learned responses we assume that there are different kinds of learning. Explanations of why children learn are based on observations of what they learn. Because what they learn generally seems to satisfy some desire or drive, we surmise that the stronger the drive, the greater the effort

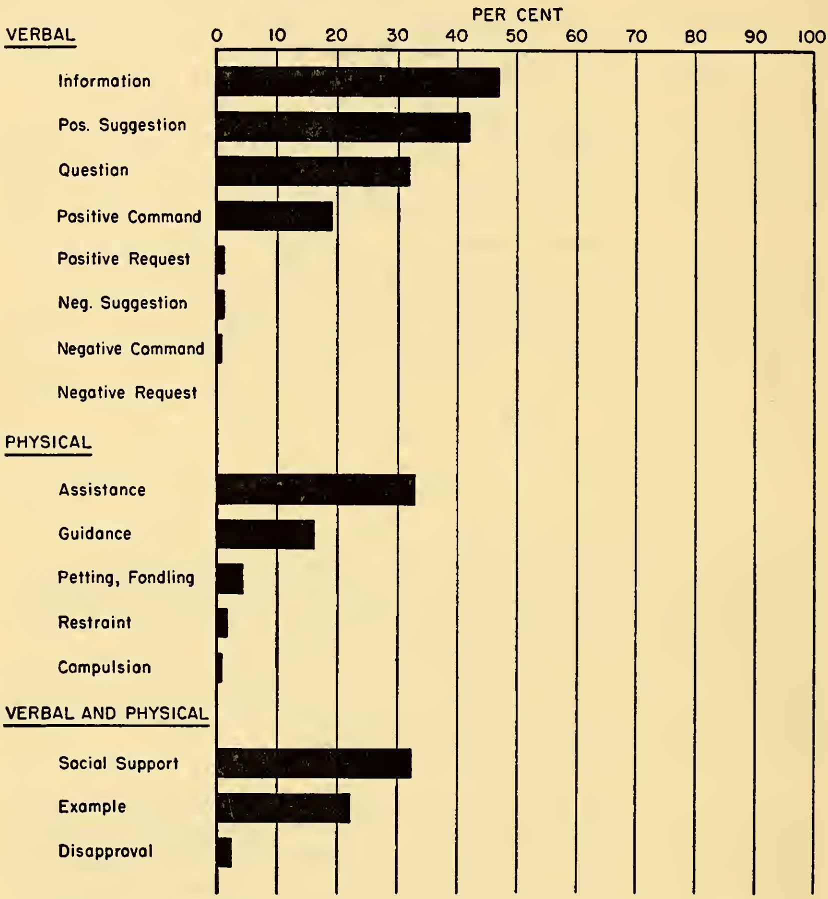

Figure 91. Teacher-child contacts of four teachers in a university nursery school. From C. Landreth, et al., "Teacher Child Contacts in Nursery Schools," *J. Exp. Educ.*, 1943, *12,* 65–91.

or learning. Drives are primary or innate and secondary or learned. Mild frustration of a drive tends to whet or strengthen it. Prolonged gratification or reward of drive-directed behavior tends to set or perpetuate the rewarded behavior.

A young child is learning all the time. What he learns depends on what he is ready to learn. It also depends on what his attention is

directed toward, on what he wants, on what he does, and on what brings him reward or satisfaction of some sort.

Recommended Reading

Readings in Child Psychology, edited by Wayne Dennis (New York: Prentice-Hall, 1952): pp. 37–48, Wickens, D. D., and C. Wickens, "The problem of conditioning in the neonate" (An account of experimental conditioning of infants under ten days old.); pp. 199–223, McGraw, M., "Later development of children specially trained during infancy" (A comparison of the development of fraternal twins age six. One had been given laboratory training from shortly after birth until 22 months. The other at 22 months commenced intensive training in the same activities in which his twin had been trained.); pp. 224–34, Jersild, A. T., "Training in vocal ability" (This study describes one type of early training, in producing vocal notes and intervals, that is retained for years.); pp. 224–34, McGraw, M., "Neural maturation as exemplified by the achievement of bladder control" (The effectiveness of bladder training at different ages in two pairs of identical twins.).

Recommended Films

"Comparative tests on a human and a chimpanzee infant of approximately the same age." Silent, 12 mins.
This film brings out the relative effects of different rates of growth and learning ability in an infant and chimpanzee reared in the same environment.
Penn. State College Psychological Cinema Register

"A long time to grow." Sound, 35 mins.
This film shows two- and three-year-olds in a nursery school learning and growing.
New York University Film Library

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Chapter 11

MENTAL FUNCTIONING

What do intelligence tests measure?

What information would be necessary in order to evaluate the possible significance of an IQ score?

What kinds of performances are represented in intelligence tests for infants six months of age and children six years of age?

Can adoptive parents be assured, on the basis of infant test performance, that a baby will later be able to successfully complete a college education?

Some young children seem brighter than others; they remember what they are told and they seem to understand what is going on. Alert and enquiring, they keep adding to a working fund of simple concepts, and they manage to take care of themselves because they respond adaptively when confronted by new situations. This *quality of effectiveness in functioning* is noted by their elders who refer appreciatively to such children as being "bright as a button." Other remarks made about "brightness" in young children similarly reveal popular notions concerning its nature. Thus, "he's smart for his age" suggests a *developmental* factor, and "he's got a good head on his shoulders" indicates that brightness involves a quality of *mental* functioning. "That boy will go far" likewise suggests that "brightness"

at one period represents behavior potential, and is thus *predictive* of future performance.

Origins of Interest in Measuring Quality of Mental Functioning

A BEHAVIOR characteristic as widely noted as effectiveness of mental functioning has naturally attracted the attention of scientists as well as of the general population. Attempts have, therefore, been made to measure and compare the quality of mental functioning in different individuals, to determine how constant it remains throughout the life span, and to arrive at some understanding of its nature by seeking evidence of its genetic origin and of its relationship to other behavior characteristics and to environmental circumstances.

Scientific curiosity has not been the only stimulus to attempts to measure the quality of mental functioning. A swelling demand for such information comes from adoption agencies who seek to match babies' intellectual potential to that of their adoptive parents, from medical practitioners who require measures of mental functioning so that they can relate neural damage resulting from brain injury or infection to subsequent behavior, and from behavior clinicians who need such measures to determine what part the quality of mental functioning plays in social adjustment. In addition, many parents seek objective and quantitative confirmation of their hopes or fears concerning the quality of their child's mental functioning.

Both scientific and popular interest in measuring mental functioning in young children have been sparked by the development of "mental tests" for school children. These were developed around the beginning of the century to determine which school children were incapable of benefitting from regular methods of instruction. At a time when democratic processes were resulting in approximately equal educational opportunity for all, it was a matter of democratic and pedagogic chagrin to find that all were not equal to benefitting from this opportunity. Evidence of their inequality in this respect posed judicial as well as educational problems. Juvenile delinquents were therefore "tested" to determine to what extent their delinquency might be due to deficiencies in mental functioning. Later when the United States entered the First World War, an unusual opportunity was offered to use newly developed "mental tests" in measuring the "intelligence" of the entire army inductee population. Publication of the results of this mass testing enormously stimulated popular interest in and demand for measures of mental functioning. Such terms as "IQ," "moron," and

"mental age" became household words, and misconceptions multiplied concerning the nature of "intelligence" and the purpose and value of "intelligence tests."

As misconceptions still prevail, it may be helpful to keep in mind that

quality of mental functioning is inferred from performance;

tests of mental functioning are therefore tests of performance, not of capacity;

many factors affect performance besides capacity.

Factors Other Than Capacities Reflected in Performances

While "He's got a good head on him" or "She's smart for her age" reflects recognition of the part that native ability and developmental factors play in performance, other statements reveal similar general awareness of the contribution of other factors. "He can do it if he wants" from a mother ineffectually coaxing her infant to perform one of his parlor tricks implies that *motivation* is one such factor. The perennial parental excuse for a child who isn't performing up to his reputation, "He's not himself today," suggests that *emotional and physical well-being* may be others. Similarly, the quick parental defense for a child who does nothing with crayons and paper—"He's never seen them before"—indicates that *experience* is also reflected in performance.

Let us now see how these factors are taken into consideration in devising, administering, and scoring intelligence tests for children.

Intelligence Tests for Young Children

Intelligence tests for young children have developed either as downward extensions of tests for school children or as upward extensions of tests of the performances of which infants are capable at succeeding ages. Examples of downward extensions are the Kuhlman and the Stanford revisions of the Binet, as well as the Cattell Infant Intelligence Tests which are a downward extension of the Stanford Binet. Examples of tests which are upward extensions are the Gesell Developmental Schedules and the Merrill Palmer Performance Test.

Information concerning the nature of some widely used tests for infants and young children is summarized in Table 11. The infor-

TABLE 11

INTELLIGENCE TESTS FOR INFANTS AND YOUNG CHILDREN

Name of Test (*Author*)	*Ages for Which Available*	*Number of Children in Original Standardization*	*Scoring Units*
Gesell Developmental Schedules (Gesell, A. and C. Amatruda 1947)	4 weeks–3 years	107 infants, at least 26 tested at each of 20 age levels from 4 weeks through 5 years	M.A. ("maturity age") D.Q. ("developmental quotient") derived for each of four major fields: motor, adaptive, language, personal-social; or for specific functions like prehension, locomotion, manipulation, etc.
Infant Intelligence Scale (Cattell, P. 1940)	3–30 months	274 infants tested at the ages of 3, 6, 9, 12, 18, 24, 30, and 36 months	M.A. (mental age) I.Q.
California First Year Mental Scale (Bayley, N. 1933)	1–21 months	46–61 infants tested at each month from 1 to 15 months; retested at 18 and 21 months	M.A. Sigma Scores Absolute scale values
Northwestern Infant Intelligence Scale (Gilliland, A. R. 1949) (Gilliland, A. R. 1951)	Test A. 4–12 wks. Test B. 13–36 wks.	276 infants	M.A. I.Q.
The Griffiths Mental Development Scale (Griffiths, R. 1954)	1–24 months	571 infants	G.Q. ("general quotient") derived for each of five major areas: locomotor, personal-social, hearing-speech, eye and hand, and performance
1937 Revision of the Stanford-Binet Test of Intelligence (Terman, L. and M. Merrill 1937)	2–5 years Forms M and L	100 children at each half year interval from 1½ to 5½ years	M.A. I.Q.
Merrill-Palmer Scale of Mental Tests (Stutsman, R. 1931)	24–63 months	631 children between ages of 18 and 77 months	M.A. Percentile scores Standard scores
Minnesota Preschool Scale (Goodenough, F. 1940)	1½–6 years	100 children at each half year interval from 1½ to 6 years	Raw score for verbal and nonverbal scales C-scores I.Q. equivalents Percent Placement score
The California Preschool Mental Scale (Jaffa, A. 1934)	15–84 months Form A.	800 children	M.A. I.Q. Sigma score Profile score
Gesell Developmental Schedules (Gesell A. and C. Amatruda 1947)	15 months–6 yrs.	107 children tested in original infant scales	same as for infant scales M.A. D.Q.

mation includes the ages for which tests are available, the number and selection of children on whom the tests were standardized, and the units in which they are scored.

Performance Content of Intelligence Tests for Young Children

In devising a satisfactory intelligence test for young children, certain requirements must be met.

To insure adequate motivation, materials used and performances required should be of interest to young children and sufficiently familiar so that they are not overly distracting. As Figure 92 shows, test materials in current use are both familiar and of interest to young children. So are most of the performances. The standard invitation to child subjects—"It's your turn to play games"—is therefore generally descriptive of the testing process. Evidence of children's refusal of test items that they later perform successfully (Rust, 1931) suggests, however, that some items—notably repeating digits on command ("Say 634")—are not particularly interesting. Further evidence of some lack of interest or at least lack of cooperation on the part of children tested is reported in the standardizing of the Stanford Binet (Mayer, 1935). Children between 2.5 and 4.5 years averaged 4 to 7 refusals, and 75 per cent gave at least one negative response. Though these refusals were generally attributed to negativism, the fact that some tests are refused, suggests the importance of skill in administering the tests and caution in interpreting test scores.

To avoid differences in performance arising from differences in experience, test performances should be ones in which children tested have approximately equal experience. As young children are selective in their activities, a range of performances is also indicated. Determining what experiences are common to young children in the United States calls for an ecological study of the life and ways of young children in different social and economic groups of the urban and rural population. Such a study has never been made. It is, therefore, reasonable to suppose that tests designed by middle-class professional persons assume the kinds of experience that are common to their children. They are thus open to the criticism (Davis, 1948, Haggard, 1953) that they do not afford true comparisons of the abilities of children in different population subgroups. A question might of course be raised as to whether it is *possible* to devise a test that *could* offer a true or valid comparison for a range of subgroups of the population. The only way to answer this question and the criticisms mentioned is to under-

Figure 92. Materials used with Gesell Developmental Schedule. With permission of the Psychological Corporation.

take the type of ecological study suggested. Until this is done, differences in mean scores on intelligence tests of different subgroups of the population must be considered differences in Stanford Binet, (or whatever test) performance rather than differences in intelligence.

Attempting to cancel out differences in experience by testing a range of performances introduces other problems which will now be considered in connection with the requirement which follows.

To predict later from earlier performances, tests at succeeding ages should sample the same basic ability or set of abilities. But, is it possible to devise test items for the period of early childhood which test the same ability or abilities in different stages of development? Early childhood is, as we have noted, a period of emerging abilities. A child's various abilities are, therefore, not equally represented at succeeding ages because they are in different stages of development. This is well illustrated in Figure 93 which shows the standard de-

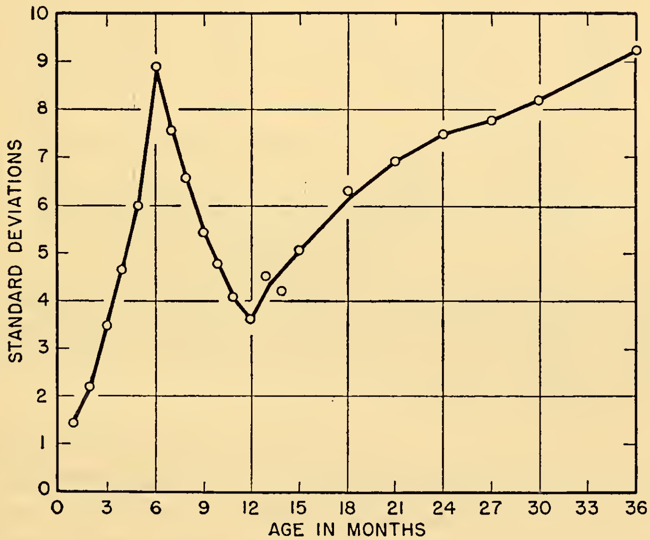

Figure 93. Standard deviation scores of 49 infants on the California First Year Mental Scale. From N. Bayley, "Mental Growth During the First Three Years," *Genet. Psychol. Monogr.*, 1933, *14*.

viation scores of 49 children at different ages on the California First Year Mental Scale (Bayley, 1933). Standard deviation or sigma scores are used because they furnish a measure of scatter or variability in the scores of the children tested. This in turn gives some indication of the stage of development of the ability or abilities measured because during rapid development variability is great, during slow development, variability is slight. How then can we explain the standard

deviation curve in Figure 93? It shows a steep rise during the first six months suggesting rapid development of abilities measured, then a sharp drop suggesting that there is little further development. This in turn is followed by an upward sweep which again suggests a stage of rapid development.

Such a curve which shows no consistency in direction suggests that *different abilities* in *different stages of development* may be represented at *different age levels* in the California First Year Scale. Figure 94 confirms this supposition. Here test performances classified as

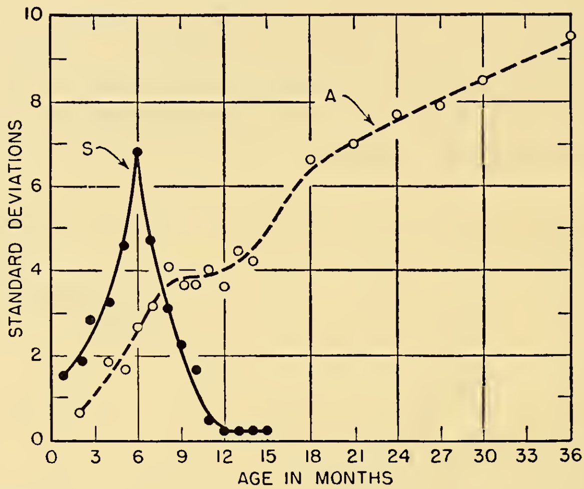

Figure 94. Infants' standard deviation scores on the sensory and adaptive items in the California First Year Mental Scale. From N. Bayley, "Mental Growth During the First Three Years," *Genet. Psychol. Monogr.*, 1933, *14*.

sensori-motor and adaptive are shown to have different standard deviation curves—a fact suggesting that the total performance curve in Figure 93 represents a composite of abilities with sensori-motor performances predominating in the first six months of life, and a later progressive increase in the proportion of adaptive performances.

The reason for the difference in performance content at different ages is obvious. During the first six months of life the performances of which a child is capable, and which are in a state of progressive development, are sensori-motor. As these abilities mature, differentiation in performances of various children tends to disappear, and simultaneously adaptive abilities progressively develop and thus lend themselves to testing.

Low correlations obtained between test scores in early infancy and in the second, third, and later years of life (see Table 12)

may therefore be explained in terms of differences in the kinds of abilities or mental functioning tested. Other explanations of low correlations between test performances in infancy and later years will be considered later. Meanwhile it is reasonable to assume that tests of *specified abilities* should lead to greater prediction of the future development of these abilities than a test of an unspecified composite.

TABLE 12

CORRELATIONS BETWEEN INTELLIGENCE TEST SCORES OBTAINED BY THE SAME CHILDREN AT DIFFERENT AGES

(*From Honzik, M. P., 1948*)

Test			California Preschool Schedule I or II							Stanford-Binet
	Age	n	2	2½	3	3½	4	5	6	7
CPS	1¾	234	.71	.62	.52	.48	.38	.39	.27	.29
I	2	113		.71	.69	.60	.46	.32	.47	.46
&	2½	114			.73	.64	.57	.46	.37	.38
II	3	229				.71	.58	.57	.57	.55
	3½	215					.76	.71	.64	.60
	4	211						.72	.62	.59
	5	212							.71	.73
SB	6	214								.82
	7	208								

This assumption is supported by a pilot study on 23 children (Catalano, 1952) which compares preverbal skills and Stanford Binet test performances at four years of age. Though the Stanford Binet tests other mental abilities than command of language, performance scores on the total test correlate with scores on the language items in the test. Therefore the reported correlation of .45 between the number of consonant sounds made by infants and their Stanford Binet test scores at four years of age at least suggests the predictive possibilities of tests of specified abilities. (Catalano, 1952.)

To measure differences in performance, test items must differentiate between children of the same age. A test item that all three-year-olds can pass does not differentiate between their ability. Test items must, therefore, be such that, among children of the same age, some can and some can't pass. How the percentage who can or can't pass is related to the scoring or age placement of test items will be discussed later.

This brings us to the question of what intelligence tests for young children measure. Is it a characteristic or characteristics that are popularly associated with brightness or effective functioning? No attempt has so far been made to relate representative popular judgments of behavior capacities of young children to their performance on "intelligence" tests. Therefore, the performance content of these tests must

be regarded as a selection made by representatives of a selected section of the population.

Interpretation of children's scores on a particular test must also take into consideration the conditions under which the test was administered.

Administering "Intelligence" Tests

As evidence has already been offered of young children's balkiness in test situations, tests should obviously be administered only by skilled testers following a standard procedure. In addition, some record should be made of the conditions under which each child is tested, his life circumstances at the time of testing, and his health and nutritional status.

Testing Conditions

The need for recording not only the cooperation secured, but also the conditions under which a test is taken, is suggested in a comparison of test performance of two groups of nursery school children (Updegraff, 1932). One group was tested two weeks before school entry, the other two weeks after entry. Six months later when both groups were retested, correlations between first and second scores were .54 for the group first tested two weeks before school entry, .84 for the group tested two weeks after entry. The most reasonable explanation of this difference would seem to be that those tested after two weeks of nursery school were more at home in the initial testing situation than those performing in unfamiliar surroundings and circumstances. Hence they were better able to perform up to capacity.

Child's Life Circumstances

Fluctuations in children's test performances which are associated with fluctuations in the emotional circumstances of their lives are reported by several investigators (Bayley, 1949, Honzik, 1948, Despert, 1946). Figure 95 illustrates such a case. This kind of relationship was found, however, only for some children. Others who also experienced disturbing fluctuations in their home and family circumstances showed no corresponding changes in their test scores. Nevertheless, the fact that changes in some children's test performances are associated with disturbing family circumstances suggests that the more

we know about a child's life circumstances, the more meaningfully can we interpret his score.

Child's Health and Nutritional Status

Though a number of studies report negative or negligible relationships between children's health and nutritional status and their test performance, there are a few which make it impossible to rule out

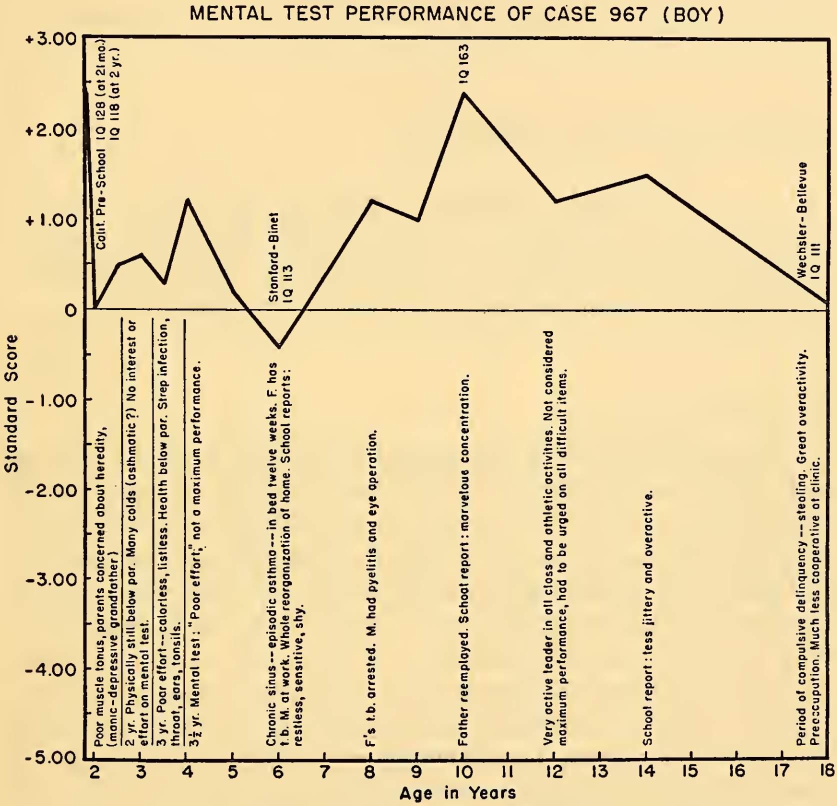

Figure 95. Fluctuations in a child's test score associated with disturbing home circumstances. From M. P. Honzik, et al., "The Stability of Mental Test Performance Between Two and Eighteen Years," *J. Exp. Educ.*, 1948, *18*, 309–324.

this factor. For instance, in two studies (Poull, 1938, Kugelmass, 1944) marked IQ gains were reported for both normal and defective undernourished children after they had undergone a period of nutritional therapy. In another experimental study (Harrell, 1946), involving 55 matched pairs of children in an orphanage, an experimental

group who were given two milligrams of thiamine daily for a year showed significantly greater gains in a number of mental functions and in educational achievement than did a control group who received only a placebo. Thus some record of a child's health and nutritional status at the time of testing is advisable in interpreting his score.

The method of scoring a test also affects the interpretations that can be made of test scores. Further, as all scoring is based on comparisons of an individual's performance with those of other individuals, the population sample on whose performance the score values were based or standardized must also be considered in interpreting scores.

Standardizing and Scoring Tests

The popular judgment—"no more sense than a baby"—suggests that one method of appraising performance is in terms of what is standard or average for a particular age. This is what is implied when scores are computed in terms of mental age.

Mental Age Scores

To illustrate, in the Stanford Binet Tests, there are 6 test items for each 6-months age interval from two to five years. A three-year-old taking this test receives the mental age score of the age level at which he passes all 6 tests plus one month for each test item beyond that age level. If he is given a mental age score of 3 years and 6 months, it means that his performance was equivalent to the average of the three-and-a-half-year-old children on whom the test was standardized.

Who were these children? The population sample on whom the Stanford Binet was standardized was 100 children at each age tested, from two to five years. These children were white native-born Americans selected to represent a social and economic cross section of the rural and urban population in the United States.

As for the age placement of the test items, this was based, not on simply putting a test at the age at which 50 per cent passed, but on a complex of considerations including the age at which some younger children could and some older ones couldn't pass it. Age placement is a difficult and unsatisfactorily solved problem. Its inadequacies are revealed in decided differences in the particular Stanford Binet test items, 1916 revision, passed by gifted, average, and subnormal children with the same M.A. score (Merrill, 1924).

Mental age is not entirely satisfactory as a score unit because a

year's mental test acceleration in a two-year-old represents relatively greater acceleration than it does in a six-year-old. An index has, therefore, been devised which relates mental age to chronological age. This is the intelligence quotient IQ = MA/CA.

Intelligence Quotient Scores

To illustrate how the IQ relates mental acceleration to the age at which it occurs, a child with an M.A. of 3 years at 2 years of age has an IQ of 3/2 = 150; one with an IQ of 7 years at 6 years of age has an IQ of 7/6 = 117. The IQ thus makes a year's mental test acceleration at different ages more meaningful. However, though popularly meaningful because in school-age children it is demonstrably related to success in school, the IQ too is arithmetically misleading. This is because variability in test performance is not the same at all ages. In the standardization of the Stanford Binet Test, the standard deviation for children's scores at two and a half years was 20 points, at six years of age it was 12 points. A six-year-old with an IQ of 120 is thus more superior to the average of his age peers than a two-and-a-half-year-old with an IQ of 120.

Reasons for differences in scatter or variability in performance at different ages can be explained in terms of differences in test item composition at different ages and in rates of development of the performances tested. Recourse has, therefore, been had to scoring children's performances in terms of a measure of the variability or scatter of the group on which the test was standardized or of a particular group with whose performances the children's are being compared.

Standard Deviation or Sigma Scores [1]

These scores have the advantage of making it possible to compare a child's performance to that of a group at different age-periods. Figure 96 indicates the kind of individual curves that can be obtained in this way for children given repeated intelligence tests. The position of child A relative to the group fluctuates, that of B improves, of C deteriorates, and of D remains much the same.

Though these sigma scores are arithmetically superior to M.A. and IQ scores, they also are not completely satisfactory because, as already explained, they do not have the same score point value at all ages. A two-year-old with a 1 σ score has an IQ score of 120 points,

[1] The symbol for sigma is σ.

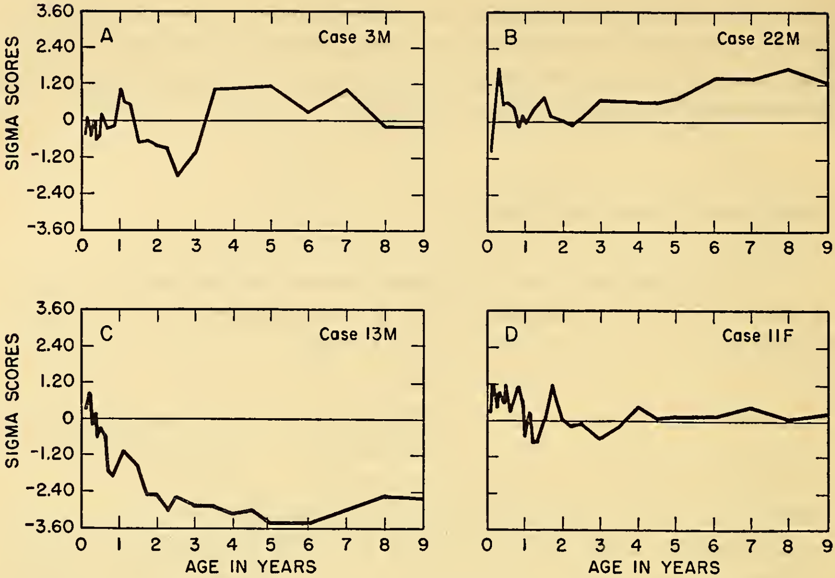

Figure 96. Sigma scores on intelligence tests of four children. From N. Bayley, "Mental Growth in Young Children," in Part II, *Thirtyninth Year Book,* National Society for Studies in Education, 1940.

a six-year-old with the same σ score has an IQ of 112 points. Sigma scores *could* have the same score point value at different ages only if the variability in performance on items or combinations of items at one age level were the same. Attempts (Thurstone, 1928a,b), so far not completely successful (Holzinger, 1928), have therefore been made to scale test items in terms of their absolute difficulty. If this were possible, performance on test items would represent a progression of equal rather than irregularly sized steps.

Regardless of what type of scoring is used—mental age, intelligence quotient, or some variant of sigma scores—such score or scale values should be applied only to children whose life experiences are similar to those on whom the test was originally scaled. The importance of relating scale values to the experience of children compared in this way is underscored in reports (Klatskin, 1952) which reveal that a *representative* sample of young children tested in the 1950's were superior in average performance to the *representative* group on which the test was standardized in the 1930's. The most reasonable explanation of this rise in average score is that the life experiences of children today are conducive to better performance on a specific "intelligence" test than were the experiences of children twenty years ago. In this there is an interesting parallel to the progressive increases

in height and weight averages of succeeding generations of children. In this there is also evidence that interpreting a test score or scores is a far from simple matter.

Interpreting Test Scores

To a question, "What does an IQ of 110 mean?," the following information would be necessary for a meaningful reply.

Concerning the subject with the IQ of 110:

His age in months.

His test experience: Is this his first, second, or a later test?

His nutritional status.

The education and occupation of his parents.

The emotional circumstances of his life: serene or disturbed.

His behavior during the test: cooperative or resistant, tense or comfortable, evidence of maximum or minimum performance.

Concerning the administration of the test:

The tester's skill and experience.

The setting in which test was given: familiar or unfamiliar to the child, distracting or conducive to concentration.

The length of time taken in testing.

The date at which test was given.

Concerning the test:

The nature of the test.

The items on which child passed and failed.

The characteristics of the population sample on which the test was standardized and the date at which it was standardized.

The method of scaling test items.

The variability or scatter in performance at different ages for gifted, average and subnormal children.

A young child's "intelligence" test score therefore compares his performance with that of a group of children his age on selected types of behavior that are not equally represented at succeeding ages. Now let us see to what extent these scores reflect genetic and environmental factors and to what extent they are predictive of future test performance.

Genetic Factors Reflected in Intelligence Test Performance

Parent-Child and Sibling Resemblances

For evidence of genetic factors in intelligence test performance, we may inspect the resemblances in members of the same family, particularly when those members are separated and hence not sharing the same environment. As the performance content of tests differ at different age levels, comparisons of parent-child, sibling, and twin test scores *should* be based on scores obtained at the same ages on the same tests. Such comparisons are, however, not available. Doubtless though they soon will be, since longitudinal studies made over the past thirty years (Bayley, 1949, Macfarlane, 1938) now provide population samples of parents who were tested at frequent intervals from infancy to maturity. Now too, an oncoming generation of nursery school children have parents who were also nursery school children and had their Stanford Binet test scores recorded at three and four years of age.

Meanwhile we can infer from correlations between test [1] scores of school age children and their parents (Burks, 1928, Leahy, 1935) and of school age "siblings" (Conrad, 1940, Roberts, 1941) that if correlations were available that were based on scores on the same test taken at the same age by young children and one of their parents or siblings the correlation would probably be .5 or better. See Figure 97. We can also infer from correlations of .63–.65 between test scores of school age fraternal twins and of .84 to .88 between scores of identical twins (Stocks, 1933, Newman, 1937) that similar correlations for preschool children would be as high or higher.

If we wish to know whether these relationships would be found if young children were living in a different environment from their family, we again have to refer to studies on older children. In one such study in which children had been separated from their mother for a period of twelve years, a correlation of approximately .4 was found between the test scores of these children and their mothers (Skodak, 1949). In another (Hildreth, 1925), in which siblings had been separated for four or five years, the correlation between their test scores was .49. It, therefore, seems reasonable to assume that a correlation of .4 or .5 between children and one of their siblings or par-

[1] Scores were obtained on tests taken at different ages and in some cases on different tests.

ents reflects the contribution of similar inheritance rather than similar environment.

As for the magnitude of this contribution, a correlation of .4 or .5 indicates that intelligence test ability inherited from one parent contributes 16 to 25 per cent, as explained on page 11, of the variance in young children's test scores. Were it possible to obtain a multiple

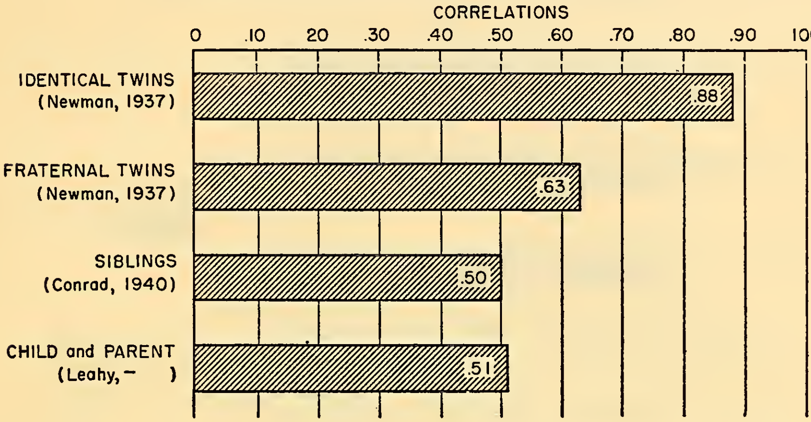

Figure 97. Relationships between family members' test scores which suggest a genetic factor in intelligence test performance.

correlation involving both parents' and all four grandparents' test scores as well as those of the children, it is possible that the genetic contribution revealed in this way would be much higher. It is also possible that such multiple correlations might throw light on a phenomenon in parent-child resemblance, called *regression to the mean,* which is illustrated in Figure 98. Here it can be seen that children of high-scoring[2] fathers tend to test slightly below the paternal score and children of low testing parents to test slightly above it (Outhit, 1933).

Occupational and Educational Group Differences

Though there is a dearth of evidence concerning young children's and their parents' actual test scores, reported relationships between children's scores and their parents' occupation, and evidence of general intelligence, give *somewhat* the same kind of information, because (as Figure 98 indicates) members of different occupational groups have different average test scores. Therefore, when chil-

[2] Occupation is here taken as an index of probable test score.

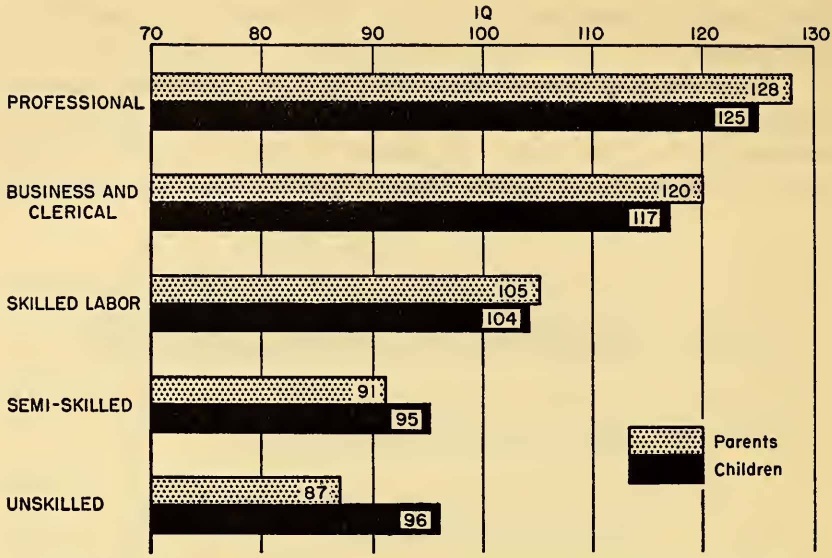

Figure 98. Intelligence test scores of parents and children in different occupational classes. From H. E. Jones, "Environmental Influences on Mental Development," *Manual of Child Psychology*, 582–632. John Wiley and Sons, Inc., 1946. Data from Outhit, Archives of Psychology.

dren in each of these groups have approximately the same average test score as parents in these groups, *one* interpretation is that children's performance reflects inherited ability.

The reason for interpreting parent-child group resemblances in test scores in terms of inherited ability rather than environmental stimulation is, as we shall see later, that children placed in foster homes over a period of several years have test scores that correlate .07 to .20 with those of their foster parents', but .4 or .5 with those of their biological parents (see Figure 99).

In one such comparison (Honzik, 1957) of children's test scores and their biological and foster mothers' education, it was found that a correlation of approximately .4 with the biological mother was obtained both for children living with their mother and for those separated for a period of twelve years. In contrast, Figure 100 shows that test scores of the group separated from their biological mother correlated negligibly with measures of their foster mothers' education.

Other evidence of a relationship between young children's test scores and the average of their two parents' years of schooling has been similarly interpreted as indicating that intelligence test performance is *to some extent* an inherited ability. The reason for assuming

some relationship between years of schooling and intelligence test score is that the *average* test scores of grammar school, high school, and university graduates show a progression from approximately 100 to 120 IQ points. It is, therefore, of interest that children's test scores for the first year of life correlate negatively with their parents' years

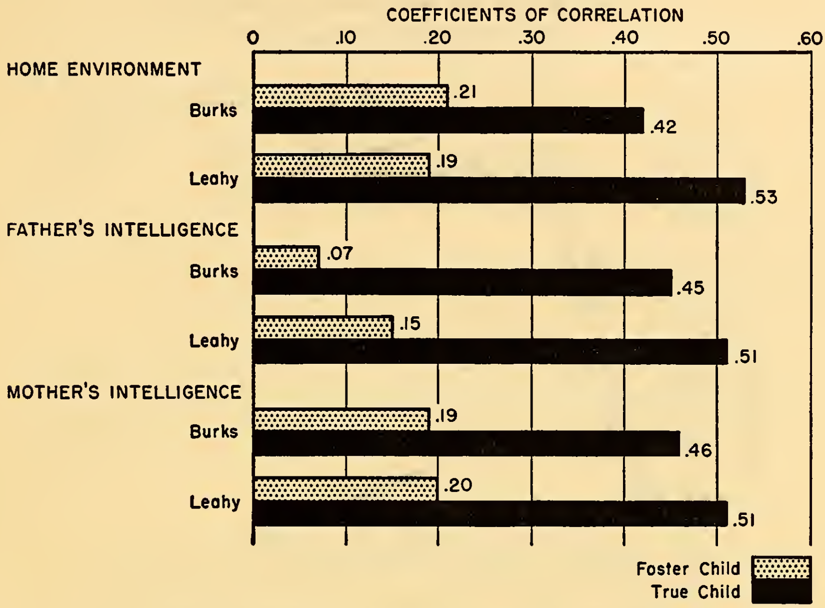

Figure 99. Correlations between the intelligence scores of children and their biological parents, and children and their foster parents. From H. E. Jones, "Environmental Influences on Mental Development," *Manual of Child Psychology*, 582–632. John Wiley and Sons, Inc., 1946.

of schooling (see Figure 101), but mount sharply by the second year to reach the .5 level at four years of age (Bayley, 1954).

A similar relationship is reported between young children's test scores and a psychologist's ratings of their mothers' intelligence. Here too there is evidence of an increase in this relationship with age. One explanation of the negative or slight relationship in the first two years is that the sensori-motor performances tested at those age levels are only slightly involved in later tests or in later educational achievement.

Another explanation is that in 1930, when these correlations were obtained, parents with more education may have played less with their babies and given them less mental and social stimulation than parents of less education. The reasoning here is that parents with less educa-

tion were less acquainted with then current laissez-faire strictures on infant care. Yet another explanation is that babies who are advanced in simple types of mental functioning may have less potential for developing more complex mental functioning. This line of reasoning is based on comparisons of the maturity at birth of different animal spe-

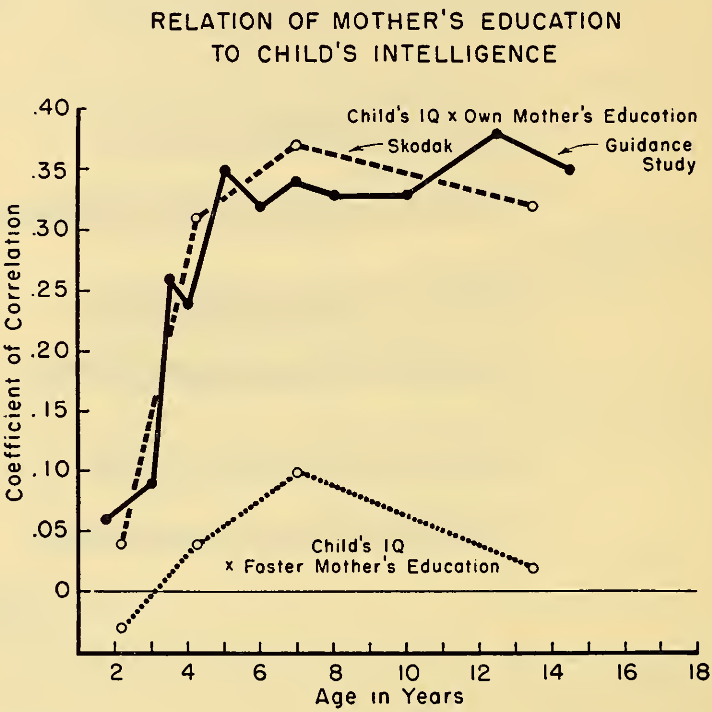

Figure 100. Comparisons of correlations between children's intelligence test scores and their biological mothers' education and their foster mothers' education. From M. P. Honzik, "Developmental Studies of Parent-Child Resemblance in Intelligence," *Child Develpm.*, 1957, *28*, 215–228.

cies and the level of mental functioning they attain relative to their species. Thus the more mature a species is at birth, the less likely it is to be high on a comparative scale of mental functioning for all animal species.

It appears then, that the kinds of performance, and hence of abilities, measured in intelligence tests reflect to an undetermined extent the operation of genetic factors. That such factors are so far not reflected in tests below the two-year level appears to be due to the methods of investigation employed. Were children and one of their siblings or parents compared on the basis of tests administered in infancy, the results might be different.

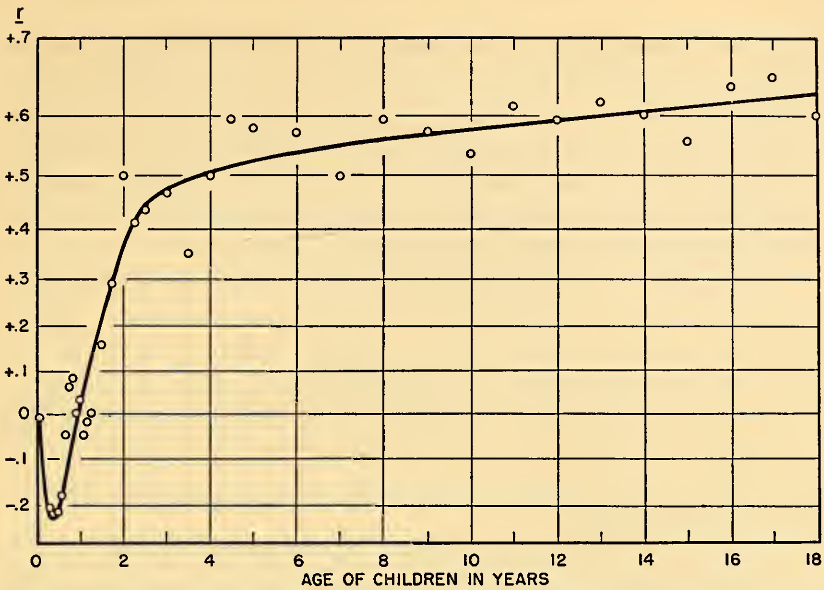

Figure 101. Correlations between children's intelligence test scores and their parents' years of schooling. From N. Bayley, "Some Increasing Parent-Child Similarities During the Growth of Children," *J. Educ. Psychol.*, 1954, *45*, 1–21.

Environmental Factors Reflected in Intelligence Test Performance

It is difficult to devise methods of measuring the relative contribution of environment and heredity because neither the social circumstances of individual's lives nor their genetic endowments can be manipulated in an experimental and systematic manner. Psychologists have, therefore, had to make the most of whatever comparisons fortuitous changes in individuals' life circumstances have presented.

One such comparison is the differences in children's test scores as a result of their placement in a foster home.

Foster Home Placement

On the basis of random placement, one would expect no correlation between test performance and foster home environment if the test indeed measured genetic endowment only. Any positive correlation would, therefore, indicate some influence of environmental factors. Unfortunately for the testing of this relationship, foster home agencies always attempt to match, to the best of their ability, a child's

foster or adoptive parents' characteristics to what they know of his biological parents' characteristics. With such selective placement operating to an undetermined degree, interpretations of correlations between children's and foster parents' test scores are difficult. However, as Figure 99 shows, such evidence as is procurable suggests that the contribution of home environment is slight compared with that of inherited capacity (Burks, 1928, Leahy, 1935).

Information concerning the two studies on which Figure 99 is based is that each involved 200 children placed in foster homes before 12 months of age. In each, intelligence tests of the foster parents were obtained as well as a cultural and economic assessment of the home environment and a record of the child's IQ after he had reached school age (between 5 and 14 years). In each study a parent-own child control group was also set up to permit comparisons with the foster child group.

Another comparison made possible by naturally occurring differences in the environments of young children is that between the test scores of children who have attended nursery school and those who have not had this experience.

Nursery School Attendance

Obviously, any investigation of the influence of nursery school attendance on intelligence test performance calls for experimental and control subjects matched in terms not only of initial test performance but of all factors other than nursery school attendance that could conceivably influence later test performance. These factors are age, sex, health and nutritional status, emotional adjustment, and parents' education and occupation. The number of factors involved suggests that a research design is needed which permits comparative study of the influences of different lengths of attendance in different types of nursery school on the intelligence test scores of children of different age, sex, level of test performance, health and nutritional status, emotional adjustment, and home environment.

As such a research design has so far not been employed, the evidence from studies to date (such as those of Goodenough, 1928, Barrett, 1930, Wellman, 1945) is somewhat conflicting and difficult to interpret.

What it seems to suggest is that the effect of nursery school attendance on children's intelligence test performance depends on the characteristics of the children and on the characteristics of the nursery school and of the children's home environment. On this basis one

would expect children with an initial low or average test performance and an intellectually impoverished home environment to increase in average test score after successful placement in a warmly supporting, intellectually stimulating nursery school atmosphere. One would also expect that children with an initial high test performance and an intellectually stimulating and emotionally supporting home atmosphere would show little average gain in test score after a period in a nursery school that offered little in intellectual stimulation or emotional support.

Qualitative Differences in Nursery School and Home Experience

The inconclusive nature of studies which treat nursery school experiences as a constant suggest that a more productive approach might be relating qualities of nursery school and home experiences to specific test performances. That such an approach would actually be fruitful is suggested in studies which compare children's test performances in terms of the quality of their experiences.

The Influence of the Quality of the Nursery School Program

In one study (Dawe, 1942) a group of orphanage children were given a period of enriched experience which included much personal attention from a trained nursery school teacher, field trips, listening to stories, and looking at pictures. As a result, their vocabulary, concept and intelligence test scores improved (as shown in Figure 53, page 158), while those of a group with similar initial scores but no intervening enriched experiences showed no such improvement. What this study suggests is that experiences specifically designed to improve an environment that is markedly unfavorable to effective mental functioning result in improved mental test performance. It does not suggest that any children attending any nursery school will necessarily improve in mental test performance. Nor does it imply that the gain in performance reflects a gain in capacity. What seems more likely is that a favorable environment gives children a chance to perform at their maximum capacity.

The Influence of Qualitative Differences in Home Experiences

A recent study (Koch, 1954) compares the performance on the Primary form of the S.R.A. Primary Mental Abilities Test of five-year-old boys and girls with one sibling. The child subjects were se-

lected in such a way that there were equal numbers of girls and boys with younger and with older brothers and sisters separated in age from them by less than two years, by 2–4 years, or by more than 4 years. Comparisons of these groups' test scores suggested that superiority on total and verbal test scores was influenced to some extent by the child's having a sibling who competed for parental attention. Thus second-born surpassed first-born children in total test score, presumably because they were intellectually alerted as a result of competing with an older child, and children with a male sibling surpassed those with a female sibling because a young male is more "alerting" than a young female.[3] As for the verbal test scores, boys performed significantly better than girls *only* when they were first-born and had a sibling 2–4 years younger—a spacing which apparently ensured these boys a period of their mothers' undivided attention before they had to compete for this attention with a sibling. The fact that first-born boys with a younger sibling surpassed first-born girls with a sibling at the same age-spacing is explained by the investigator in terms of evidence that mothers give more attention to young boys than to young girls.

These observations made on two-child families do not permit generalizations concerning three-, four-, or more-child families, since the interacting variables in larger families are obviously not the same as those in two-child families.

As evidence has already been offered of a relationship between test performance and nutritional status, it appears that the environmental circumstances associated with maximum test performance are those that stimulate specific learning processes or that contribute to a physical and emotional state that is conducive to performing to capacity.

Predictive Value of Intelligence Test Performance

The low predictive value of intelligence test scores in early childhood has already been indicated in Table 12, page 333. A more precise statement of the prediction possible is that it is inversely proportionate to the age of testing and to the length of interval over which prediction is attempted. This is graphically represented in the curve in Figure 102 which shows correlations between test scores at different ages with that at eighteen years of age.

The reasons for low prediction from early tests have already been

[3] The investigator's interpretation.

indicated; the low reliability reflects differences in test composition at different ages and differences in stages of development of the abilities tested. These in turn result in differences in variability or scatter at different age levels and hence differences in scale values.

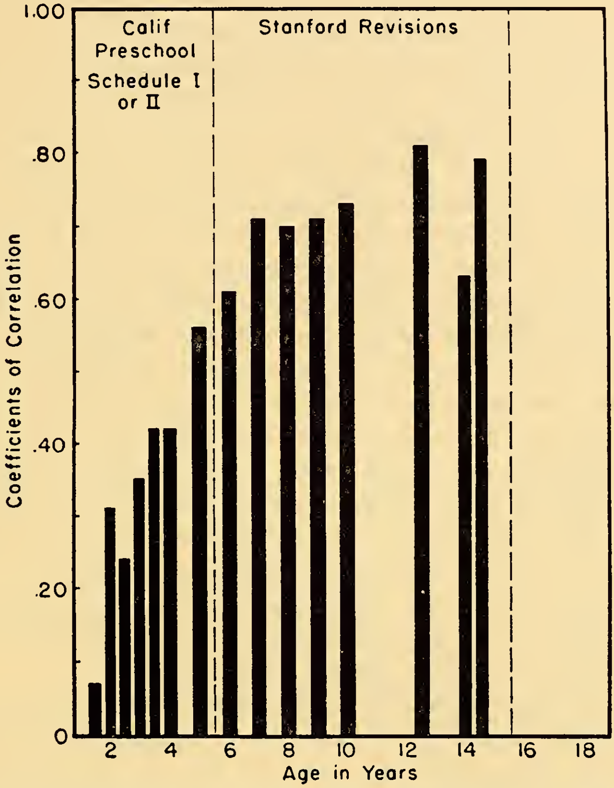

Figure 102. Correlations between children's intelligence test scores at eighteen and earlier years. From M. P. Honzik, et al., "The Stability of Mental Test Performance Between Two and Eighteen Years," *J. Exp. Educ.*, 1948, *18*, 309–324.

Given a measuring device which has mathematical flaws in its units of measurement and which measures behavior qualities whose function in the mental life of the child are not completely understood, what can one say of its scientific and practical usefulness?

Contributions of Intelligence Testing to Understanding Development of Behavior

FALLIBLE as such tests are and confusing though they have become because of being termed measures of intelligence, the fact

remains that they have compared selected performances in a standard situation of large numbers of children of different ages, and different economic, educational, and occupational family backgrounds. They therefore offer more quantitative information concerning the various factors that influence some human behavior than is available from any other source, because no other research tool has been so widely used.

They have, for instance, demonstrated that genetic factors contribute to the performances the tests measure. They have similarly revealed that developmental factors are involved, determining in part the stage at which test performances emerge and the rate at which they develop. The influence of environmental factors is also reflected. There are even indications of the general nature of the environmental factors that promote an individual's maximum performance. For the present these appear to be whatever environmental circumstances favor optimal nutritional status, emotional and social adjustment, and intellectual alertness. In addition, reports of relationships between a lack of close personal attention in the first year of life and depressed test performance (Spitz, 1945, Goldfarb, 1945) suggest that more rigidly controlled studies might reveal critical stages in development for the operation of certain environmental factors. Finally, the fact that children tested over an age span present individual patterns of fluctuation in performance (see Figure 96) suggests that if the proper study of man is man, this study will be advanced by comparing an individual, not only with individuals his age, but also with himself at different ages and in different life circumstances.

As intelligence tests were originally designed with the practical purpose of measuring children's ability to succeed in school, let us now consider the practical interpretive value of these tests for young children. The factors that have to be taken into consideration in interpreting an individual test score have already been summarized. They suggest that a single test score gives some indication of how a child is functioning at a particular time, under his own particular life circumstances, and relative to other children of similar age and life experience. An analysis of test item performance makes it further possible to determine on which performances a child is abreast of and on which behind the group. Such an analysis therefore gives some idea of the kinds of experiences a child is ready for. Repeated tests give further indication of the child's pattern of development relative to his life circumstances. By four years of age (Honzik, 1948), children's test scores correlate to the magnitude of .6 with those they receive at six years of age. Tests at this year therefore give some indication of probable success in school and hence may contribute to a better school placement.

As intelligence tests for infants and young children are one of the criteria on which adoption policies are based, it is worth considering separately their limitations in this respect. Suppose an adoptive parent wishes to know whether a baby under one year of age will be capable of successfully undertaking a college education at eighteen years. What can he learn from an infant intelligence test? Practically nothing, because infant test scores correlate negatively or negligibly with scores at eighteen years of age (see Figure 102). Even at two years of age test scores correlate only to the magnitude of .3 with those obtained at eighteen years, and it is not until a child reaches six years of age that correlations of the magnitude of .6 are obtained. Even with this correlation individual prediction can be made only with large error. The following distribution of IQ changes for children tested eight times between 6 and 18 years of age suggests the difficulties inherent in individual predictions based on a group correlation of .6 (Table 13).

TABLE 13

CHANGES IN INTELLIGENCE QUOTIENT SCORES OF CHILDREN BETWEEN SIX AND EIGHTEEN YEARS OF AGE

(*From Honzik, M. P. 1948*)

I.Q. Changes Between 6 and 18 years	*Guidance* $n = 114$ %	*Control* $n = 108$ %	*Total* $n = 222$ %
50 or more I.Q. pts.	1	—	.5
30 or more I.Q. pts.	9	10	9
20 or more I.Q. pts.	32	42	35
15 or more I.Q. pts.	58	60	58
10 or more I.Q. pts.	87	83	85
9 or more I.Q. pts.	13	17	15

If limited predictive information is available from a single infant intelligence test, what other sources of information can be drawn upon to improve prediction?

It has already been noted that by four years of age children's test performance correlates with that of a single parent to the magnitude of .4 or .5. If, therefore, intelligence tests can be made on the biological parents of an infant, adoptive prediction can be improved. It is however generally impossible to obtain an intelligence test on the father of a child born out of wedlock, and a test on the mother made during a period when she is disturbed and depressed by problems associated with her illegitimate pregnancy may give a lower score than she is capable of.

Therefore it would seem that the best that can be done in apprais-

ing an infant's or young child's intellectual potential is to combine information from several sources. Examples of such information are:

> indications of the parents' level of intellectual functioning revealed in intelligence test scores, school performance, choice of occupation and occupational achievement;
> the child's prenatal and birth history;
> the child's postnatal developmental history;
> the child's illnesses, particularly those likely to affect nervous tissue;
> the child's performance on a battery of tests;
> the child's early care, whether socially friendly and responsible or less suited to optimal social development.

One writer (Macfarlane, 1953) suggests that a practical procedure in adoption might be to put the major emphasis on the needs of the adopting parents and adds that perhaps all parents who want to adopt infants should be told, "This child may turn out to be of average ability, below average, or superior. So might one of your own." Obviously any adopting parents who want a specific guaranteed type of family member should ask themselves whether they are sufficiently mature to face the genetic and environmental hazards of parenthood.

Review

The nearest approach that has yet been made to measuring the mental abilities involved in behaving effectively in complex life situations is that represented in "intelligence testing." Intelligence tests compare, in quantitative terms, selected performances of children the same age with similar experiences in regard to the performances tested. Some tests have been developed as downward extensions of tests for school-age children, others as upward extensions of the performances of which infants are capable at succeeding ages. Some tests, such as the Stanford Binet, represent an undifferentiated composite of different performances; others, such as the primary form of the S.R.A. Primary Mental Abilities Test, combine tests of two or more particular kinds of performance.

Because individuals' performances may be affected by their level and rate of development, their motivation, experience, and physical and emotional well-being, these factors must be taken into consideration in constructing, administering, scoring, and standardizing tests, and in interpreting test scores.

Devising intelligence tests for the first six years of life is complicated by the fact that this is a period of emerging abilities. Hence

it is difficult, if not impossible, to provide similar performance content at each age level. It is also difficult, if not impossible, to scale tests in such a way that scale units have the same value, because the abilities tested in early childhood are in different stages of development. As a result, children are more variable or scattered in performances that are developing rapidly, less variable in those just beginning to develop or reaching maturity.

Differences in performance content and scale values of undifferentiated composite tests suggest that future measurement of the quality of mental functioning might profitably be directed to exploring developmental stages and individual differences in *specific kinds* of mental functioning.

Despite flaws in current intelligence tests, intelligence testing has added immeasurably to our understanding of behavior because it has furnished information concerning factors related to the behavior in a standard situation of large numbers of individuals of all ages and all social and economic subsections of our society. In addition to revealing the complexity of factors involved in effective functioning, intelligence tests have practical usefulness in indicating how a child is functioning, relative to other children his age, on a sample of performances. Because these performances are, from four years upward, related to success in school, they give some indication of the kind of school experience from which a child can profit.

Recommended Reading

Psychological Studies of Human Development, edited by Raymond G. Kuhlen and G. G. Thompson (New York: Appleton-Century-Crofts, 1952): pp. 149–58, Honzik, M. P., J. W. Macfarlane, and L. Allen, "The stability of mental test performance between two and eighteen years" (The results of repeatedly testing the same individuals from 21 months to 18 years of age show stability and variability of different children's intelligence test performances.); pp. 210–15, Hollingworth, L. S., "An intellectually gifted child" (A description of the family background, interests, and education of a child with an IQ over 180.); pp. 158–64, Skodak, M., and H. M. Skeels, "The intellectual growth of adopted children" (Children whose mother was intellectually below average when tested showed intellectual growth (which could not have been predicted from their mother's test performance) at an early age when placed in desirable adoptive homes.); pp. 199–214, Terman, L. M., and M. H. Oden, "The development and adult status of gifted children" (An account of the adult development of more than one thousand children who earned an IQ of 140 or above on the Stanford-Binet 1916 test.).

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Chapter 12

THE CHILD'S INTERACTION WITH HIS ENVIRONMENT

Are "permissive" and "democratic" meaningful descriptions of a wise relationship between a mother and her young child?

To what extent is it true that the child makes the mother?

What would seem wise steps in preparing for and handling an unavoidable period of mother-child separation?

What advantages and disadvantages may brothers and sisters represent to a child?

Are the opinions of his playmates a factor in a nursery school child's behavior?

Are there any warrantable generalizations concerning occupational and educational class differences in child-rearing practices?

Are all young children affected in the same way by the same events?

Do you "feel" the same toward all the young children you know?

ALL HUMAN BEHAVIOR takes place in an environment of some sort. It is, therefore, not surprising that relationships have been

traced between young children's behavior and factors in their environment. Already we have seen, in prenatal life, that in the early stages of cell division the differentiation of physiologically specialized cells and tissues is in part due to biochemical influences exerted by surrounding cell masses. At later stages we have noted that the developing fetus continues to be affected by characteristics of the uterine environment. Still later the newborn infant shows signs of learning, even in the first ten days of life, thus revealing the modifying effect of environment on human behavior.

This effect is apparent in all types of behavior. Sex differences in motor performances and development of right or left handedness are, as already explained, in part accounted for by the differing social pressures brought to bear on boys and girls in our society. Differences in the rates at which infants acquire adult speech sounds; in the size of their vocabularies and the length of their conversational units are likewise, *in part,* attributable to the environmental stimulation they receive from adult speech models. Their perception is also affected by their experience, as is evident in their overestimation of the size of objects previously associated with a reward.

As for their general intellectual functioning, intelligence test scores obtained under different testing conditions indicate that this too is affected both by the immediate circumstances of the test situation and by the emotional tenor of children's lives, as well as by their inherited mental abilities.

In social and emotional behavior, the influence of environmental factors is even more obvious in an array of relationships between what children do and how they have been done by. Thus, their specific fears, in part, reflect their particular experiences and their anxieties the frustrations they have endured. Their overt and fantasied aggression is likewise related to the kind of punishment they receive from their like-sex parent and their attitudes toward sex and ethnic roles to the social and economic circumstances of their lives.

Dramatic evidence of one type of relationship between experience and behavior is offered in a documentary film, "Search." In it a poignant sequence occurs when a roving band of destitute European children, made homeless by World War II, run in terror from Red Cross officials because they are adults and hence, in these children's experience, agents of death and destruction.

How can we relate and order this variety of fragmentary pieces of information which research reports continue to disclose concerning the modifying influence of environment on young children's behavior? One psychologist (Lewin, 1935) has offered a formula for behavior: B=f (P.E.). Behavior is a function of the person and the en-

vironment. He suggests that we may eventually be able to express the influence of environmental factors on an individual's behavior in mathematical terms. Such formulation awaits, however, more definitive research on behavior than has so far been possible. Meanwhile, perhaps the best we can do is to consider environmental circumstances in terms of their psychological significance for particular children at particular stages of their development. This involves considering environmental circumstances in terms of children's interaction with them. One of the most important of these interactions is that between a child and his mother.

Mother-Child and Father-Child Interaction

Current study of the nature of this interaction offers a refreshing change in emphasis from earlier work directed at determining a mother's part in making her child the kind of child he is. Now a group of psychologists and psychiatrists (Escalona, 1953, Fries, 1938, 1945) are studying the infant's part in making his mother the kind of mother she is. Specifically they are interested in finding out whether there is a relationship between an infant's constitutional characteristics and his mother's mode of responding to him. They are also trying to determine whether there is in turn a relationship between mother's mode of stimulating—fondling, smiling, or talking—and the infant's mode of perceiving his mother and his environment.

Stimulus That a Child Represents to His Parents

What makes it plausible to assume that an infant's constitutional characteristics may affect his mother's responses is that wide differences in these characteristics have been noted. It is, therefore, reasonable to suppose that a mother who leaves the delivery room with a baby who cries four hours out of the twenty-four, (Aldrich, 1945) who is exceptionally reactive to stimuli, who has difficulty in establishing a feeding response, and who breaks out in hives at slight provocation, has heavy demands made upon her maternal resources. In contrast, a mother who leaves with an easy-going baby who cries less than an hour a day, nurses with efficiency and appreciation, and can take stimuli or leave them alone, presents much lighter demands. It is also reasonable to suppose that it may be particularly trying for a mother to have a "difficult" type for her first baby, or to have an "easy" first followed by a baffling second child.

Apparently a factor in mother-child interaction, besides the child's characteristics per se, is the extent to which they conform to the mother's hopes and expectations. Thus a study (Sloman, 1948) of problem behavior in "planned for" children revealed that some parents planned, not for *a* child, but for a particular type of child. As a result, they were unable to reconcile the child of their conception with the child of their frustrated plans. In another study (Macfarlane, 1954), some fast-tempoed mothers were baffled by the dawdling of their slow-tempoed child.

Though research on relationships between infant characteristics and maternal responses has not developed to the point at which specific generalizations can be made, there are enough indications of *a* relationship to suggest that all who work with mothers of young children should be sensitive to their individual problems. The quality of motherhood must sometimes be strained by what it is called on to mother. It is thus best understood in behavioral rather than in exclusively moral, theological, sentimental, or legal terms.

Further, if the characteristics of an infant or child can affect the response of his mother, it is reasonable to suppose that they can also affect the response of other adults. It is, therefore, wise to examine a current convention among nursery school teachers of maintaining stoutly concerning their young charges that they love them all—the docile and the defying. The fact is that even nursery school teachers are given to replying to a query of how a particular morning has gone with a "Fine"—to which is added parenthetically, "Bill and Harry weren't here today," indicating that Bill and Harry make certain kinds of demands on a teacher that are not made by others present.

It would thus seem helpful for any professional worker with young children to ask herself concerning her charges: "How does Bill, or Mary, or Dick, make me feel—protective, inadequate, or effective?" Having asked this question, two others are in order, "Why do I feel this way?" and "Is the way I respond to a particular child the most helpful to him?"

As illustration that some professional workers are aware of this, the writer recently attended a case presentation at a children's behavior clinic. When the psychiatrist, the psychologist, and the psychiatric social worker had completed their reports on what was obviously a most difficult problem, the director of the Institute asked the psychiatrist if he would handle the case any differently if he had a chance to repeat his efforts. The psychiatrist thought a moment before replying that if he were doing it again he would limit the therapy sessions to twenty minutes as it was difficult to "like" the child (with the behavior problem) for more than twenty minutes at a time.

In brief, the stimulus a child presents to his mother or any other adult is dependent on both *the child's and the adult's characteristics and on the adult's expectations concerning the child.*

Relationships between children's *developmental* characteristics and adult responses are already well authenticated. For instance, in a study based on home interviews, parent behavior toward three-year-old children was rated more affectionate, permissive, and indulgent and less restrictive and severe than that toward nine-year-olds (Baldwin, 1946). In another study, analysis of teacher-child contacts in a nursery school revealed that the three-year-olds received a higher proportion of gestures and physical contacts; the four-year-olds more verbal directions and suggestions (Landreth, 1943). (See Figure 103.)

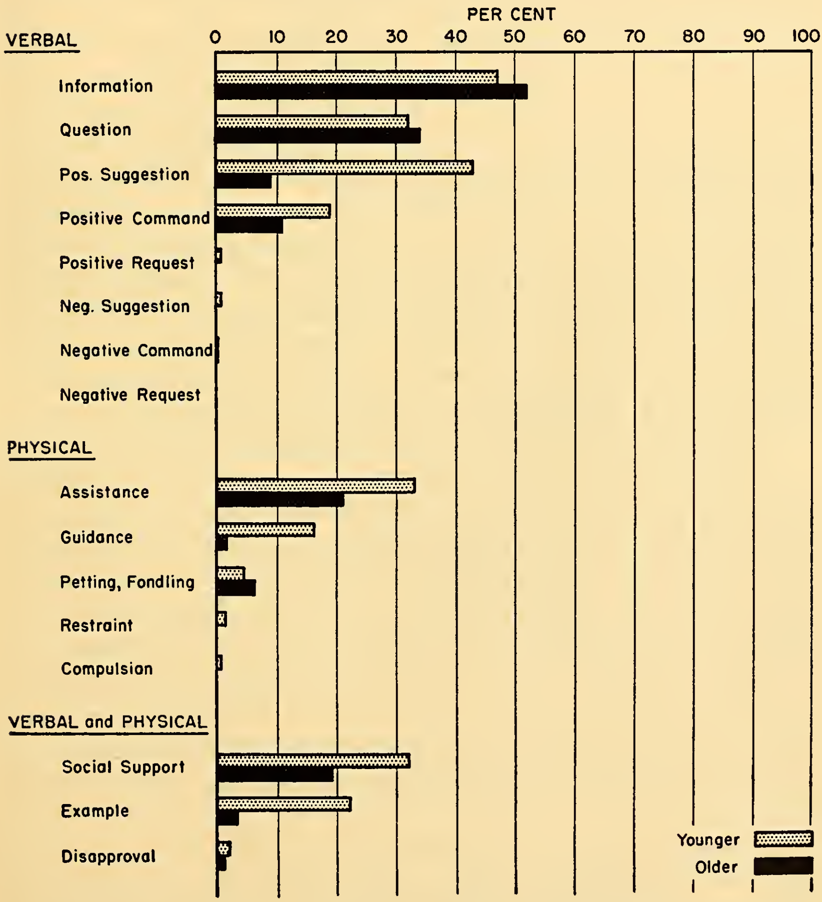

Figure 103. Teacher contacts with three- and with four-year-old children. From C. Landreth, et al., "Teacher Child Contacts in Nursery Schools," *J. Exp. Educ.*, 1943, *12*, 65–91.

Now we await proof, or disproof, that other child characteristics also evoke a selective social response, and in this way contribute to development of the child's personality.

Dual Nature of Parental Role

A mother, or for that matter any adult working with a young child, necessarily assumes two roles. On the one hand she gives a child affection, interest, attention, indulgence or, in a word—*nurturance;* on the other, she exercises *control,* in some way, over his behavior. Recent studies and clinical reports suggest that children respond better to guidance from parents or teachers when a nice balance is maintained between nurturance and control.

In one such study (Baldwin, 1945), already mentioned, trained interviewers rated the child-rearing characteristics of a large number of homes of young children on the basis of two-hour home visits made when the children in the homes were at different ages. As a result they found that nurturant and control characteristics varied from home to home and within the same home at different periods. There were also indications that as nurturance diminished and control increased, the children became more balky and demanding of attention. As illustration, during a mother's pregnancy children received less "approval, affection and acceptance," and more "restrictive handling, severe penalties and coercive suggestions." The children, presumably as a result, showed signs of disturbance and uneasiness (Baldwin, 1947).

The Gilbert and Sullivan refrain, "A policeman's lot is not a happy one," should remind us that control that is not tempered by interest and affection is not well received. In contrast, the part interest and affection play in a child's willing acceptance of adult control is movingly evident in a documentary film, "The quiet one." In this film a Negro boy with unhappy home experience and a variety of behavior difficulties, including recurrent "running away," is placed in a center for disturbed children. There a worker first establishes an easy, friendly, supporting relationship with the child. As he becomes aware that he has at last found someone who likes him and whom he can feel secure in liking, the boy becomes able and eager to behave in socially acceptable ways.

A variety of reports similarly indicate directly or indirectly the significance of balancing control with nurturance in teacher-child (Thompson, 1944), parent-child (Hattwick, 1936, Lewis, 1954, Radke, 1946) and therapist-child interaction (Freud, 1928). Physicians too

are learning the value of doing something *for* or *with* a child before doing something *to* him. Hence they first show some interest in child patients before peeling off their clothes and listening to their hearts or poking instruments in their ears and noses.

Parental Nurturance

The influence of parental nurturance on a child, like the influence of any other experience, depends on its various characteristics or dimensions. Therefore it should be considered in terms of the *amount or degree of nurturance* given, its *continuity* or *discontinuity*, and its *developmental* and *individual* appropriateness for particular children.

Amount of nurturance

Some information concerning the influence of a marked *lack* of nurturance comes from comparisons of the behavior of two groups of children, one reared in an institution, the other in foster homes (Goldfarb, 1943, 1944). The group who spent the first three years of their lives in institutions had many problems of adjustment when they were later placed in foster homes. Twelve of them, in fact, had to be replaced into other foster homes, some as many as three times, during the three-year period of this study. In contrast, the group who spent the first three years of their lives in foster homes had few problems of adjustment in the ensuing three years, and only one had to be replaced. There were, moreover, twice as many behavior problems in the institutional group, and the problems were of a different kind from those of the group of foster-home children. The institutional children were disobedient, hyperactive, restless, distractible, and unable to concentrate. Behavior problems of the foster-home group were of a more passive, moderate type.

Though the numbers of children in this study are small, and though members of the two groups could not be matched for native characteristics, there is at least tentative evidence here that lack of a source of personal interest and attention in early infancy affects social development. Specifically, it seems to handicap children in learning how to get along with other people. If we were to state this in terms of current learning theory, we would hypothesize that when infants' dependency drives are not gratified, the infants *do not learn* that they can

depend on or trust others. Therefore, they do not cooperate effectively with them.

Another way of stating this is that when infants' dependency drives are not gratified, they develop anxiety about dependency. This particular hypothesis has been tested by comparing infant-care practices and explanations of illness in 75 primitive societies (Whiting, 1953). Specifically, it was hypothesized that if infants' dependency drives were inadequately gratified, their resulting anxiety about dependency would be reflected in their explanations of illness. This actually proved to be the case. Societies rated high in dependency anxiety more frequently explained illness in terms of soul loss or spirit possession than societies rated low in dependency anxiety. Concern about soul loss and spirit possession was considered by the investigators to reflect underlying anxiety about supernatural dependence.

Though associated circumstances, such as infant care practices and explanations of illnesses, are not necessarily causally related, it is possible that they may be. We have, in fact, from animal experimental work, some evidence of such a causal relationship. Rats deprived of food in early infancy showed either increased hoarding tendencies in adulthood or a faster eating rate following a period of food shortage (Marx, 1950, 1952). Control rats who were not deprived in infancy did not exhibit this behavior. Therefore the hoarding rats apparently developed anxiety associated with their drive or desire for food.

The influence of a *slight lack of* nurturance is not the same as that of a marked lack. Slight frustration of young children's dependency drive or desire for nurturance appears to strengthen the drive or whet the desire. To illustrate, in one study (Lafore, 1945), parents who made the fewest affectionate advances to their children received the largest number of such advances from them. In another (Koch, 1955), kindergarten children with a sibling who offered them considerable competition for maternal favors made more friendly, attention-seeking advances to their teacher than children who did not have this kind of competition. In seeking attention from the teacher, children were presumably generalizing a response initially developed to their mother.

What happens when children get an overdose or excess of nurturance is a little hard to determine. In several studies some parents were rated as being oversolicitous and overattentive (Hattwick, 1936, Levy, 1943). Their nurturant behavior appeared, however, to be developmentally unsuited to their child rather than simply excessive. Further their nurturance was accompanied by some thwarting of their child's drive for independence. To illustrate, some oversolicitous mothers buttered their teen-age child's bread, helped to dress him or her, and had the child sleep with them.

Developmental Appropriateness of Nurturance

One age's nurturance may be another age's nuisance. To illustrate, maintaining close physical contact with a child may represent nurturance to an infant, but may be a nuisance to an active three- or four-year-old. In this connection an analysis of the contracts children made with a nursery school teacher is of interest (Horowitz, 1940). The two- and three-year-old children generally sought physical help or assistance of some sort; the four-year-olds sought the teacher's encouragement, interest, and approval.

Our concept of appropriate nurturance is now enlarged by evidence (Rheingold, 1956) that even young infants prefer their nurturance tailored or adapted to their individual requirements. This evidence comes from a study which compares the quantity and quality of nurturance given two experimental and two control groups of four infants in a foundling hospital. Also compared are measures of social responsiveness in the four groups of infants. During the study each experimental group was cared for by one person (the investigator) for seven and a half hours a day, five days a week, for a period of eight weeks. The control groups were cared for by the hospital routine. Systematic time-sampling observations of the caretaking acts in the experimental and control room revealed that caretaking acts occurred in the experimental room 23 per cent of the time. All of these acts were performed by one person. In the control room caretaking acts occurred only 7 per cent of the time and were performed by fourteen different persons.

As some indication of the influence of these different types of nurturance, the experimental infants were rated more friendly and socially responsive than the control group at the end of the eight-week period. The investigator attributes this difference not to the substitution of "one mother" for "many mothers," but to the quality of individually adapted attention the experimental infants received.

Whenever we hear of infants receiving adequate "physical care" we should therefore ask, how adequate?

Continuity of Nurturance

Children who receive nurturance and are then deprived of it react differently from children who suffer a continuing lack. In one study an investigator (Spitz, 1946) made photographic and written records of the behavior of infants who were deprived of their mother and given no mother substitute during the second six months of their lives. They received, however, "adequate physical care." The exact

location of the institutions, the reasons for withdrawal of the mothers, and the details of infant care provided are not reported, but a cinema reel, "Grief," showing the infants' behavior, presents some woefully forlorn and unhappy babies who appear incapable of responding to the advances of a friendly adult. Also presented are some of the same babies responding normally to friendly overtures after their mothers have again returned to them. The interpretation of the infants' reported and photographed behavior is that deprivation of maternal care and affection during the second six months of life results in a seriously disturbed emotional state and that reinstatement of the mother, if the interval of her absence is not too prolonged, reverses this process.

Though the results from this study are difficult to interpret because of lack of pertinent information (Pinneau, 1955, Spitz, 1955), other studies (Aubry, 1956, Bowlby, 1951) support Spitz's general conclusion concerning the importance of a child's unbroken relationship with his main source of love and nurturance. These later reports also indicate that a child's need for an unbroken relationship increases during a period of stress.

As illustration, in a film, "A two-year-old goes to hospital," we see a child's reaction to being separated from a loved and loving mother to undergo mild surgery. Though the child had been told in advance of her impending stay in hospital, the explanations were apparently meaningless because removed from her experience. As a result, she is first outwardly disturbed, then apathetic. When her mother comes to visit her, she fails to recognize her, suggesting that she may be afraid to establish again a close relationship with a person who failed her at the most difficult moment in her life. Not all children would respond in just this way. What Aubry's and Bowlby's written reports indicate is that separating a child from his mother during a period of stress for the child leads to disturbed behavior of some sort.

The film has, of course, obvious implications for the handling of sick children. It also has implications for handling children separated from their parents for any reason, vindicating as it does the induction procedures in university nursery schools that have already been described.

Evidence that a mother's presence does help her child to respond adaptively to a strange situation comes from an experimental study (Arsenian, 1943). Reactions were compared of 24 children (11–30 months of age) when alone or accompanied by their mother in a strange room which was attractively decorated and had many toys and pictures. Those with their mothers displayed three times as much adaptive behavior and one third as much emotional behavior as those alone. Further, when those who first entered the room with their mother

were later taken there alone, their adaptive behavior decreased. Those who were first taken alone became only slighly more adaptive when they were accompanied, by their mothers, in later sessions. This suggests that initial insecurity was difficult to overcome.

There is incidentally in this study a clue to the nature of effective nurturance. It is not a matter of doing something *for* or *to* a child. It is more simply a matter of doing something *with* him, of being there, of being interested and understanding. When we express interest in and seek understanding of any individual, we affirm his worth. What this may mean to him is incalculable. The need to be valued is at least as great as the need to be loved.

What the studies so far reported suggest is that the quantity and quality of nurturance a child receives, its appropriateness for him, and its continuity or discontinuity are reflected in his behavior.

Let us now see what characteristics or dimensions of parental control have been studied and how children react to them.

Parental Control

Young children appear to seek parental nurturance; there is little convincing evidence that they seek parental control. To the contrary, after the first year of life they progressively seek a measure of independence, a pursuit in which they must often be frustrated by adult controls.

When and why do adults exert control of one sort or another over children's behavior? Logically external control should be limited to situations in which the child's lack of judgment and ability to respond effectively threatens his safety and well-being, or that of others. Control such as this, which is adapted to the child's ability to assume control himself, could well be called *adaptive*. This would incidentally be a more meaningful term for wise parental control than "permissive," which creates confusion because it does not indicate the basis of permission.

Over-Control

What happens when parents *over-control* situations a child could manage himself? Aside from robbing the child of a maturing experience, over-control creates a poor parent-child relationship. This is indicated in a study of mother-child interactions in a standard play situation (Bishop, 1951). Each mother was told that the purpose of the study was to observe her child's play. The mother, therefore, was free to

read or sew or do as she wished. From behind a one-way-vision screen the observer noted that mothers differed in frequency and mode of interacting with their child. Further, children's responses differed with their mothers' mode of interacting. Correlations of .5 to .7 between mothers' directing, interfering, and criticizing approaches and their child's negativism and refusal suggest that even a young child does not like to be told how to run his business.

In other studies (Hattwick, 1936, Macfarlane, 1954, Levy, 1943), parental oversolicitousness, expressed in part in doing and deciding for a child what he was capable of taking care of himself, was found to lead to angry dependence. This suggests that one explanation of the recurrent progression of peaceful and stormy years in a child's development, noted by Gesell (1943), is that the child periodically outgrows controls that are no longer developmentally appropriate.

This also suggests that all who work with young children need to revise constantly the controls they exercise so that the controls may keep pace with each child's ability to assume responsibility, rather than reflecting some deep-seated desire on the part of an adult to dominate or to encourage defiance of authority.

Why do some parents over-control their children? Apparently because they lack understanding of their child's behavior capacities or are insecure in their personal or parental role. The influence of *lack of understanding* is revealed in a comparison of behavior of fathers (university students or staff members) who were absent from home during a period of military service with that of fathers who were continually present (Stolz, 1954). The fathers who were away from home at the time of and for more than 10 months following the birth of their first child seemed to be "problem" fathers. They were overstrict in their discipline and uninformed concerning developmental factors in children's behavior. Their children, presumably as a result, were unable to express aggressive impulses, were less competitive and less socially successful with other children, more compulsively obedient and at the same time more defiant.

Further evidence of a *relationship between parental understanding and parental methods of control* comes from a comparison of "very strict" and "very permissive" mothers' ability to predict their five-year-old child's behavior in a test (Bellinger, 1953). The ratings of "strictness" and "permissiveness" were based on mothers' answers to a series of questions. The behavior which the mothers tried to predict was their child's choice of one of a pair of line drawings showing contrasting types of child behavior. The kinds of behavior depicted in this way were sharing a toy with a younger child or snatching it, swinging a young child or pushing him away from the swing, includ-

ing a younger child in a story with his mother or excluding him. The outcome of this comparison was that 12 mothers were better and 11 poorer predictors. Of the 12 better predictors, 10 were rated as using low control and giving high acceptance to their children. Of the 11 poorer predictors, 7 were rated high in control and low in acceptance. It appeared, therefore, that the "permissive" mothers used less control because they understood better what their children were capable of managing themselves.

Evidence that *parental insecurity* leads to over-control comes from a study (Block, 1955) of a group of military officers, classified as "restrictive" or "permissive" fathers on the basis of their answers to a questionnaire concerning child-rearing. When these two groups were compared on a large number of independently measured personality attributes, it was found that the *restrictive* fathers tended to be constricted, submissive individuals with little self-assurance.

In an experimental test of the *relationship between parental security and parental control*, Bishop extended her study of parent-child interaction. She told half of the mothers that their child had not done as well as she thought he could and that she would like to observe him again. The other half of the mothers were told that a second observation would be made as a check on the first one. Under these circumstances the mothers who thought their child hadn't done as well as he might became more criticizing and directing in their interaction with him. The mothers who thought the second observation was merely a recheck showed no such change in behavior. This study suggests, incidentally, that remarks about a child's behavior which have the sole effect of making his mother uneasy do more harm than good.

As it is obvious that parents need to revise constantly the controls they impose, how can they determine when it is time for revision? A story may illustrate.

A university professor who is also the mother of a five-year-old son was called from a seminar to learn that her boy had been lost in a downtown store four miles from his home. The housekeeper who had been with him at the time and who normally kept him under tight supervision had looked everywhere with no result. The police were alerted and the parents passed an anxious two hours. At the end of this time, their footsore five-year-old came dragging in. Under questioning it was found that he recognized he was "lost" and had therefore followed the car line number which he had seen passing his home; checking at junctions to keep himself oriented. Both parents decided then and there that a child who had the resourcefulness and resolution to make his way home through heavy traffic no longer needed to have an adult's hand in his when he went round the block.

Under-Control

Parents may under- as well as over-control their children, requiring them to make decisions involving their health and well-being for which they lack experience and judgment. This occurs when parents permit children to stay up at night until they reach a state of tense exhaustion in which it is difficult for them to get to sleep. Under-control is also evident in parental laissez-faire attitudes to what and when children eat, regardless of the consequences to their nutrition and general health. In early childhood, however, parental concern for childrens' health and safety is less likely to lead to under- than to over-control. This probably accounts for the lack of systematic study of under-control.

Meanwhile, observation of children in play therapy, which has the purpose of releasing inhibited feelings, has lead therapists to set limits, even in these situations, to what the child can do. Setting such limits presumably gives the child a feeling of security in the adult's judgment and willingness to assume responsibility. The child therefore need not feel anxious about doing something which is unacceptable, but is free to behave as he wishes within the stated limits.

Way of Exercising Control

The way in which control is exercised is as important as its developmental appropriateness. A small but significant relationship, already reported, between mothers' ease in expressing themselves and the incidence of irritability, temper tantrums, and nail biting in their children (Macfarlane, 1954) suggests that clear and definite statement plays some part in effective control or guidance. For the rest, parental methods of guidance and control have yet to be analyzed in terms of their various dimensions. When they are studied in terms of their vagueness and definiteness, their mildness or harshness, their consistency and inconsistency, their purpose as perceived by the parents and their result as perceived by the children, many fragments of information we now have concerning child-parent interaction will fit usefully into place.

Meanwhile, it appears that when controlling procedures are harsh and punitive in character, the child's drive for independence figuratively goes underground. This outcome is shown in Figure 89 (page 319), which shows the responses of young children to low and high "punitiveness." The severely punished become outwardly more conforming and less aggressive, but show increased aggression in projective doll play sessions.

In contrast, when the child's drive for independence is met by

permitting him the independence of which he progressively becomes capable, the outcome is different. The child sees the reason for external control and is helped both to achieve maturity and to develop a good relationship with the parents who are legally and socially responsible for his behavior.

One example of this kind of controlling procedure is planning the physical circumstances of a child's environment so that he has freedom with safety, within limits circumscribed by doors, fences, and gates. Another is making it possible for a child to do what he wants in ways that are acceptable to the persons he lives with. Thus a four-year-old boy is given his own work bench with tools he is completely free to use, while his father's tools, which he is not free to use, are locked up.

Safety rules that are clearly stated and accompanied by a logical reason, as for instance, "Roller skates in the cupboard so that no one will trip on them," rather than "Put these roller skates away" or "We don't leave roller skates around," have a similar purpose. As for procedures which give the child progressive experience in handling his own affairs, having a child look both ways whenever the group he is with crosses the street prepares him to have the freedom of his immediate neighborhood.

Evidence that young children are both willing and eager to take over rules of conduct when they are simple, clear, and consistent comes from the analysis, reported earlier, of children's contacts with nursery school teachers. An increase with age in children's seeking adult encouragement and approval suggested that children were progressing from the "I can do it myself" stage to the "*How* am I doing" stage.

Taking over rules of conduct or adult controls suggests that young children imitate or identify with their parents.

Identification with Parents

Evidence that young children do act like their parents is found in their development of speech and in the relationship between the number and nature of their mothers' fears and their own (Hagman, 1932). Similar evidence comes from the study (Bellinger, 1953), mentioned earlier, in which "strict" and "permissive" mothers predicted their children's responses to pictures and incomplete stories which offered a choice of "controlling" and "accepting" behavior toward a younger child. When the mothers' scores for controlling and accepting attitudes (based on their replies to a series of questions) were compared with the children's choices of pictures or story completions, the results were as follows for the 23 children and mothers studied.

Of the 11 children who chose pictures showing high control of younger children, 7 of their mothers were rated high in control.

Of the 10 children who chose low control, 9 of their mothers were rated low in control.

Of the 9 children who chose pictures showing high acceptance of younger children, 7 of their mothers were rated high in acceptance.

Of the 11 children who chose low acceptance, 6 of their mothers were rated low in acceptance.

Furthermore, four-fifths of the children had the same control rating as their mothers. About two thirds of the children had the same acceptance rating as their mothers.

Further evidence that children act, in particular, like their like-sex parent has been offered (Sears, 1946) in the greater amount of fantasy aggression in doll play sessions of nursery school boys with fathers at home than of boys with fathers away from home. Additional evidence that both boys and girls identify with their like-sex parent is offered in a pilot study (Welsh, 1952) in which 24 four-year-olds were asked to build all the people in their house with a choice of rectangular and cylindrical blocks of different sizes. It was noted that the boys tended to use the same type of block for themselves and their father, and the girls to use the same type (cylindrical) for themselves and their mother. Incidentally, boys built the father figure first three times more often than girls did.

Strength of identification is apparently a factor in children's response to parental control. This is indicated in a study (Levin, 1956) which sought relationships between the strength of six-year-old children's identification with their parents, the severity with which they were punished, the parent who usually did the punishing, and the children's fantasy aggression in doll play sessions.

Ratings of children's identification with their parents were based on their mothers' answers to such questions as:

"We'd like to get some idea of how X acts when he's naughtly—when he has deliberately done something you don't want him to do, when your back is turned—how does he act?"

Here it was assumed that the child's confession of anxiety concerning his "naughtiness" indicated the stage of development of his conscience or super-ego. This was, in turn, assumed to be dependent on his identification with his parent.

The results confirmed the investigator's hypothesis that the frequency of children's fantasy aggression is in part a function of the children's identification with aggressive (i.e. punishing) models. Thus boys who were highly identified with and usually punished by their

fathers showed the highest frequency of aggression. This occurred regardless of whether the punishment was mild or severe.

The relationship obtained suggests that where there is no identification, parental admonitions are probably sounding brass and tinkling cymbals. This conjecture accords well with the lack of identification commonly found between juvenile delinquents and their often harshly punishing parents.

Identification with a parent is *possibly* affected by the reputation one parent is given by the other. It was noted in one study (Bach, 1946) that when a mother spoke unfavorably of the children's father they developed curiously ambivalent aggressive-affectionate fantasies concerning him (see Figure 104). It seems probable that criticism of one parent by the other has some effect on the identification of children who are the same sex as the maligned parent, since children have diffi-

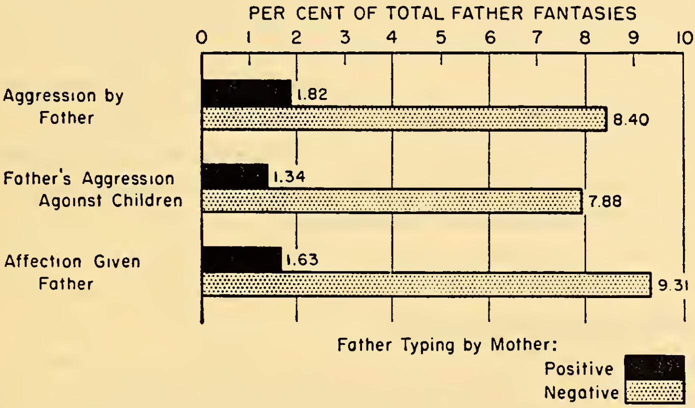

Figure 104. Father fantasies of children whose fathers are described unfavorably by their mothers. From G. H. Bach, "Father Fantasies and Father-Typing in Father-Separated Children," *Child Develpm.*, 1946, *19*, 127–136.

culty classifying objects on the basis of more than one characteristic and in understanding dual roles.

To illustrate, in one study (Hartley, 1948) children were shown pictures of a mailman carrying a mail-bag and asked, "What is he?" They were then shown the same man playing with his little boy and again asked what he was. The children were then asked if the man was a father when he was a mailman and vice versa. Children's answers showed a developmental progression from perceiving an individual as:

(1) identical with and limited to the single role in which he is momentarily observed (A or B)

(2) having at least one continuing role plus a number of momentarily occupied roles (always A, sometimes B)
(3) consisting of all the roles he occupies (always A and B)
(4) functioning in a permanent or momentarily deferred role, but having the potentiality for filling other roles (A with B potential).

On the basis of these results, it seems likely that young children may have difficulty identifying with a like-sex parent who is also a maligned character. They may also have difficulty understanding parental admonitions which are not in accord with parental actions.

As the studies reported indicate, identification in young children is, as yet, a partially understood behavior mechanism. This is largely because the term "identification" is used to refer to different kinds of behavior. Sometimes it refers to a child's taking over the characteristics of a friendly adult. Then again it is used to refer to a child's incorporating the characteristics of a feared adult. However used, identification can be understood only in terms of the age and sex of the child concerned, the sex and behavior of the parent with whom the child identifies, the kind of behavior in which identification is apparent, and the form the child's behavior takes—overt expression or fantasy.

As infants' first associations with adults are in receiving care from them, let us now consider the influence of infant care practices in the development of behavior and personality.

Parental Infant Care Practices

A survey (Orlansky, 1949) of the literature up to 1949 on this environmental factor revealed, at that time, conflicting evidence. One reason for contradictions in published reports is that practices were sometimes assumed to reflect underlying maternal attitudes. Inferences concerning practices were, therefore, in terms of the attitudes assumed to underlie them. Thus one investigator (Levy, 1943) on the basis of studying 100 child guidance patients who had been nursed in infancy for less than a month and 100 who had been nursed twelve months or longer, concluded, "In general, all factors favoring rejection of the child tend to shorten, all factors favoring over-protection to lengthen the breast feeding act." Another investigator (Peterson, 1941) studying the feeding practices of mothers of nursery school children concluded: "duration of breast feeding is not related to maternal rejection and cannot, therefore, be taken as an index of rejection."

Clarification of these conflicting conclusions comes from a later study of infant care and personality adjustment of 162 rural Wisconsin children (Sewell, 1952). These children's parents were *inconsistent*

in their use of developmentally appropriate practices in nursing, weaning, and bladder or bowel training practices. Therefore, the child care practices of this group did not reflect a consistent pervasive maternal attitude.

Another reason for contradictions in published reports is that child care practices have often been studied as practices per se, rather than in terms of the parents' purpose and the child's experience. When, in contrast, practices are considered in terms of the frustration or gratification they offer a child, published reports become more meaningful.

To illustrate, you will recall that a group of infants on a three-hour feeding schedule during the first eight days of their lives seemed more disturbed when abruptly shifted to a four-hour schedule than a group who were on a four-hour schedule from birth (Marquis, 1941). This suggests that *inconsistency* in practices is a factor in children's responses. Stating this in terms of current learning theory, initial gratification followed by later frustration produces a somewhat different response from continuing frustration.

Another factor in children's response to a frustrating parental practice is the extent to which it is offset by their other life experiences. In the study previously mentioned (Whiting, 1953), in which relationships were sought between infant care practices and adult explanations of illness, five kinds of training practices were studied. These were feeding or "oral" training, toilet or "anal" training, sex training, dependence, and aggression training. Significant relationships were obtained between frustrating oral,[1] dependence, and aggression training and explanations of illness, but not between frustrating sex and anal training and explanations of illness.

Why was this so? When we examine the descriptions of frustrating practices in these societies, it becomes clear that some were more pervasively frustrating than others. Adult frustration of infant dependency, for instance, occurred at a developmental stage when the infant had few alternative sources of satisfaction. Frustration of aggressiveness also occurred during the early stages of seeking independence and autonomy. The reason for the difference in response to frustrating oral and anal training seems equally clear. Many restrictive feeding practices occurred in the first months of life when mouth activity was dominant and the infant had few other sources of satisfaction. Therefore, they conceivably represented more of a total deprivation than restrictive eliminative practices which occurred at a later ambulant period when the range of experiences from which the child

[1] Frustrating oral training included brief and irregular feeding periods, early and severe weaning, and initial indulgence followed by later frustration. Explanations of illness assumed to reflect oral anxiety were blaming the illness on something the person ate or drank or on verbal spells or incantations.

could obtain satisfaction was more diversified. In the one case, the child's total interest in life was threatened, in the other, only a part of it.

Another factor in responses to infant care practices which has yet to be studied is the extent to which their influence is *reinforced or diminished by later experiences.* Dramatic relationships of brief experiences in infancy to adult behavior in different animal species has prompted speculation that the same relationships occur in the human species. Is such speculation sound?

The animal species in which these relationships have been noted have a brief infancy, and their early behavior is little different from that in adulthood. In contrast, the human species has a long period of immaturity during which there is a progressive emergence of ever more complex behavior. It is therefore reasonable to suppose that early brief experiences *may* make little lasting impression on human infants. What happens though when the experiences are prolonged or reinforced by later ones may be different.

Until further evidence is available, conclusions that seem warranted concerning infant care practices are that their influence depends on the frustration or gratification they offer children at particular stages of their development. And the frustration imposed by a particular practice may be offset by other life experiences. Furthermore the enduring effect of early frustration is probably dependent on the degree of frustration involved, its duration, and the extent to which it is reinforced or diminished by later experiences.

Though a young child's home environment is essentially unique, there are indications that it can, *to some extent,* be correlated with the education and occupation of his parents.

Pervasive Influence of Parental Education and Occupation

Already we have noted accelerated speech development, a greater fund of concepts, and superior reasoning ability and mental test performance in children of parents engaged in professions. There are also differences in attitudes to sex and ethnic roles and in competitive behavior in children whose parents are in professions or in unskilled occupations. While such differences may be explained in part in terms of differences in genetic endowment in each group, studies which show changes in children's mental test performance and language development following specific training suggest that environmental factors must also play *some* part.

Attempts have therefore been made to compare attitudes and

practices of parents in different social and economic subgroups of the population, and to relate these to their children's behavior.

Parental Attitudes

In one (Duvall, 1946) of a series of studies of parental attitudes, mothers representing different ethnic and religious groups and different social and economic subgroups of the population were asked "What are five things a good mother does?" and "What are five things a good child does?" Their replies were then classified in "traditional" or "developmental" categories.

Traditional categories emphasized housekeeping and maintaining discipline in good mothers, cleanliness and minding adults in good children. Developmental categories emphasized guiding and fostering the child's mental, emotional, and social development for mothers, and developing good health habits, interpersonal relationships, and learning attitudes for children. A comparison of the responses of mothers in two social and economic subgroups of the population, indicated that mothers with more educational opportunities employed more "developmental" concepts and those with less education more "traditional" concepts.

Were the mothers with better educational opportunities merely repeating what they had read or were their attitudes consistent with their practices?

Parental Practices

The evidence in regard to practices is conflicting. In a study made in the early 1940's (Davis, 1946), a comparison of feeding and toilet training practices and modes of parent-child interaction in "middle" and "lower" socioeconomic white and Negro groups revealed that "middle-class" parents were more rigorous than "lower-class" parents in feeding practices. Further they expected more and had a stricter regime for their children.

A similar study, using the same method of interviewing mothers, was made ten years later in Boston (Maccoby, 1954). At this time and in this place no significant differences were found in the practices of the "upper middle" and "upper lower" class parents.

The most reasonable explanation of the apparent contradiction here is that the two groups differed in national and religious background and that the studies were made at different periods. This in turn suggests that all generalizations concerning differences in child care prac-

tices in economic and social subgroups of the population should be dated. What may have been true in regard to age of weaning, breast feeding, and toilet training B. S. (before Spock) is not necessarily true since his book has become a household reference for a large percentage of the population.

Recent evidence in fact suggests that the extent to which parents depend on "experts" rather than on their own childhood experiences or the older generation's advice tends to reduce ethnic and social group differences at least in regard to specific practices. In one study (Klatskin, 1952), questionnaires were completed by 229 lower-, middle-, and upper-class mothers who had been taught a philosophy of flexible, developmentally appropriate child care. The data showed that, in this group, women from different social classes did not differ in their use of self-demand scheduling or duration of breast feeding.

It therefore appears likely that intragroup differences may be at least as important as intergroup differences. This has in fact already been indicated in studies which reveal that parents' personal adjustment and understanding of developmental levels of behavior are important factors in their attitudes and manner of interaction with their children.

Intragroup Differences

Thus in the study of personality characteristics of a "restrictive" and a "permissive" group of fathers who were military officers (Block, 1955), their occupations were the same and their social and economic status similar, *save in the matter of average number of years of schooling* (restrictive 12, permissive 13.5 years). Despite their similar social and economic circumstances the two groups had different attitudes toward children's behavior which were related to their personality characteristics.

Similarly the paternal behavior of two groups of student fathers (Stolz, 1954) who had similar educational, social, and economic advantages differed appreciably. Differences associated with father's absence from home, for ten months following his first child's birth, seemed to be reflected in differences in acquaintance with children's behavior.

In another study (Macfarlane, 1954) of the behavior problems of a group of normal children, the family variable most consistently and highly correlated with problem behavior in children was the marital maladjustment of the parents. This is a variable which is also relatively independent of parents' social and economic circumstances.

Differences in parental behavior between subgroups of the population have already been related to the extent to which members of

these groups relied on experts for child-rearing advice. In complementary fashion, differences in parental behavior within a group can also be related to the extent to which members rely on advice from the older generation. To illustrate, a group of 43 upper-middle-class parents of nursery school and kindergarten children reported disciplinary attitudes and practices toward their children which correlated .38 with those they had experienced themselves (Radke, 1950). Within this group there were, as the correlation of .38 suggests, individual differences in the extent to which members used practices they had experienced themselves. This suggests that within a group as well as between groups different sources of information contribute to differences in parental behavior and attitudes.

The environmental factor in the young child's development of behavior that probably ranks next in importance to his interaction with his parents is his interaction with his siblings.

Sibling-Child Interaction

So MUCH attention has been directed to sibling rivalry (Levy, 1936, Sewall, 1930, Foster, 1927, Ross, 1931), that until recently the beneficial aspects of sibling relationships have been overlooked.

During the 1950's a series of reports (Koch, 1954a,b, 1956a,b,c) from a research investigation of elegant design corrected this oversight by analyzing factors in relationships between young children in two-child families. In this investigation five-year-old boys and girls who had one sibling were compared in their mental test performance, behavior to a woman teacher, behavior to age peers, personality characteristics, and work attitudes, in terms of a number of characteristics of their siblings. The characteristics on which comparisons were based were the siblings' birth order, sex, and age, and the difference in age between siblings and child subjects.

It was found that whenever the age, sex, birth order, or some combination of these characteristics of the sib made him a competitor for parental interest and attention that the children in question performed better on the Thurstone Primary Mental Abilities Test. They also showed more interest in and sought for the attention of their teacher. The writer described the influence of the sib under these circumstances as "alerting" and interpreted child subjects' responses, partly, in terms of increased drive produced by mild frustration.

In their relationships with their age peers, the competition, companionship, and social alerting their siblings offered was similarly reflected. Thus children with an opposite sex sibling, at some age spacings, were more friendly to their age peers than those with the same sex

sibling at the same age spacings. Children's personality characteristics likewise reflected the influence of relationships with a sibling. For example, children with a brother were rated more competitive, ambitious, and enthusiastic than those with a sister, and children with an opposite sex sibling were judged more self-confident and cheerful. In their work habits, first-born girls were judged to have more initiative than boys—*when* they had a sibling less than two years younger.

In all comparisons the most significant relationships appear in the interactions between two or more factors. For instance, in verbal test performance on the Thurstone Primary Mental Abilities Test, boys are consistently ahead of girls. Differences are significant, however, only for first-born children with a sibling two to four years younger.

What Koch's meticulous analyses reveal is that the character of sibling relationships in early childhood does not depend on any single variable such as the age, sex, birth order of the sibling, or age difference between the sibling and child. It depends rather on combinations of variables which exert some modifying influence on the child's psychological environment. Among such combinations are those that insure a child several years of his mother's attention uncontested by a sib, those that lead to differential parental attitudes to a child and his sib because of their age, sex, and birth order, those that favor rivalry between sibs, and those that favor identification and companionship with the sib.

In summary it would seem that *most* age, sex, and birth order characteristics of sibling pairs offer some advantages. A child with an older sibling is likely to have more practiced and hence more relaxed parents; a child with an attractive younger sibling is likely to be socially and intellectually alerted, and a boy with a slightly older sibling of the same sex is likely to have an admired behavior model. As for the friction and rivalry between siblings, Koch's findings suggest that out of the nettle of mild frustration the child plucks the flower of fulfillment.

When a young child goes to nursery school he enters a society of his age peers. Their behavior and attitudes thus become of some significance for his development.

Peer-Child Interaction

An introductory study (Sidwell, 1957) of this environmental factor (which so far has not received the attention it deserves) revealed that four-year-olds pass judgment on each other, particularly in regard to aggressive behavior. Further, their judgments are sufficiently consistent concerning this behavior to represent a measure

of group opinion. Indications that there is sex stereotyping—describing boys as athletic and aggressive (see Figure 67, page 230) and girls as unathletic but socially conforming—suggest that peers help to reinforce cultural pressures concerning appropriate behavior for each sex. Differences between children's, teachers', and parents' judgments on the popularity of particular children also indicate that teachers and parents could profitably pay more attention to the judgments of a child's peers rather than assuming that such judgments aren't made or are unimportant.

The influence of child associates may become even more important when children lack a fixed loving adult. Anna Freud's report (Freud, 1956) of the deep bonds of affection between six orphaned European children suggests that under some circumstances children may become primary sources of love and affection for each other. This is an observation no nursery school teacher can doubt, seeing as she does the intensity of feeling that can develop between two close friends or the unhappiness that can be caused by a nursery school triangle.

A grandmother was recently reminded of the significance of child friends when her daughter and son-in-law stopped by her house at midnight to leave three drowsy and half-awake children while their mother went to hospital to have her fourth child. Though the arrangements had been explained to the children in advance, and though their grandmother and grandfather were loved figures, the middle-of-the-night change in the children's circumstances apparently called for some reappraisal of the sources of their security. As the grandmother tucked in the six-year-old, the child said thoughtfully, "Well, I have a friend now in the first grade," and with this consoling reflection fell asleep.

As peer judgments involve participation in a peer group, it is appropriate at this point to consider relationships between nursery school attendance and behavior.

Nursery School Attendance

We have already noted that some groups of children made gains in mental test performance following a period of nursery school attendance and others did not, and that one explanation of this difference is that nursery schools differ in the variety and quality of experiences they offer. Evidence that such differences do exist is offered in a comparison of teacher-child contacts made in a university and a W.P.A. nursery school (Landreth, 1943).

As Figure 105 shows, different atmospheres prevailed in the two

schools. In the W.P.A. school,[2] teacher-child contacts included more commands, more physical compulsion and disapproval, less information and fewer questions. There was also less encouragement, less guidance, and less physical assistance. In brief, the teachers in the W.P.A. nursery school seemed mainly concerned with having the children adjust to a

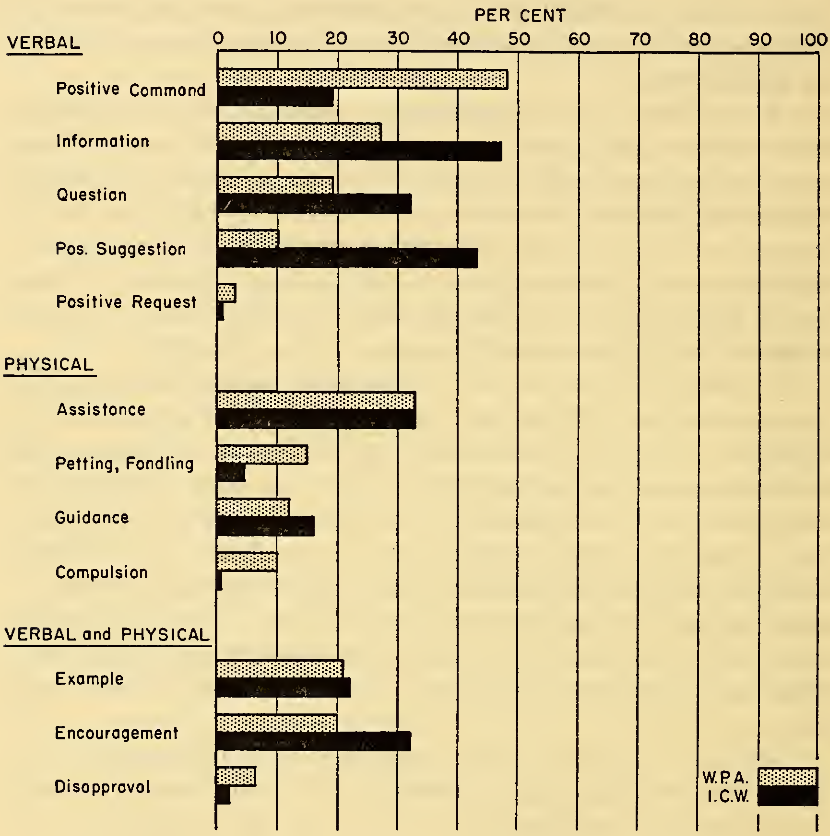

Figure 105. Teacher-child contacts in a university and a W.P.A. nursery school. From C. Landreth, et al., "Teacher Child Contacts in Nursery Schools," *J. Exp. Educ.*, 1943, *12*, 65–91.

fairly rigid routine. As one would expect, such differences in atmosphere are associated with differences in children's behavior. This is interestingly demonstrated in an experimental study of the behavior of two groups of four-year-old children who had different types of nursery school experience (Thompson, 1944). The children in these

[2] W.P.A. nursery schools, established in 1933 to provide employment for unemployed white-collar workers, were in some cases poorly equipped and understaffed by inadequately trained personnel.

groups were matched as closely as possible in terms of age, sex, mental test score, personality characteristics, and social and economic characteristics of their families. The teachers and the setting for each group were the same, but with one group the teachers were somewhat detached, allowing the children to plan their own activities and assisting them only when they specifically requested help. With the other group, the teachers were warm, friendly, and cooperative, maintaining a great deal of personal contact with the children, guiding their activities and spontaneously giving help and information. After eight months of nursery school experience the children who had high teacher guidance and active teacher participation were rated on a number of traits as having made a better social and emotional adjustment than those who experienced a more detached teacher-child relationship.

In the light of this evidence and of the lack of standardization in the training and personal qualifications of staff members in parent cooperative, private, state and community supported, and University nursery schools, any generalizations on the influence of nursery school attendance on young children's behavior are meaningless. About all that can be said concerning what nursery school experience may mean to a particular child is that this will depend on the characteristics of the child, the nursery school, and the alternatives to nursery school experience.

Though the young child is essentially a home body, the community he lives in is another environmental factor or complex of factors that influences his behavior.

Child-Community Interaction

Indications of the part an environmental factor may play in a child's life come from reports that Negro children identify themselves as Negroes at an earlier age when they attend segregated nursery schools and kindergartens (Clark, 1939). Community influences are also reflected in white and Negro children's choice of inferior housing for Negro dolls (Radke, 1950). Social attitudes are, however, not the only forms of behavior affected by community experiences. Interests, skills and concepts of a child's place in the scheme of things are also modified by the community in which the child lives. One has only to recall two recent films, "The Great Adventure" and "The Little Fugitive," to be reminded of the contrasting experiences a farm and city offer a young child. One wonders, therefore, what these differences in experience *mean* to the child. In the films mentioned, both the Swedish

child secretly sheltering and sharing his rations with an otter during the exigencies of a Northern winter, and the New York fugitive salvaging pop bottles on Coney Island were vigorously absorbed in the business of living. Both were resourceful, and both experienced a measure of success in their undertaking. How, then, can one appraise community experiences in behaviorally meaningful terms?

A recent ecological study (Barker, 1955) on the life of children in a small Midwest community furnishes some answers. In this study a team of research workers lived in the community as participating, but somewhat neutral, members. They first recorded the kind of home and community settings—family breakfast, village store, church service—in which behavior took place, differentiating settings in terms of their eliciting behavior unique to a particular setting. They then recorded the kinds of acts that took place in these settings and developed ratings for degrees of participation or "penetration" into a particular setting. To illustrate, a child at a church social who fell asleep on his mother's lap would be considered to have low penetration into this setting compared with one who sat on the piano stool and played "Long, Long Ago" to an appreciative audience. Ratings were also made of the success or frustration and the emotional climates the child encountered in different settings. These took account of the fact that a child might be scolded in his music lesson for not practising, given a peppermint stick by a friendly grocer, and told he was a good boy by Mrs. Brown when he delivered her paper.

Using the type of classification of behavior settings and behavior episodes, suggested above, a team of investigators, working half-hour shifts, recorded all that happened to each of 12 children during the waking hours of their day. There are no specific conclusions to this study other than that this small community offered its children many opportunities to be respected, contributing members. There are, however, implications that we appraise what is done *for* children in terms of what it does *to* them. Well-meaning adults often exhaust themselves doing things for children which probably mean very little to them. They design charming toys which express the creative imagination of the designer, but leave little to the imagination of the child. They plan elaborate birthday parties that are confusing and tiring ordeals to young guests. Nursery school teachers should, therefore, appraise a morning, not in terms of the activities initiated, but of the satisfying experiences of each child in their group.

Lest the impression be given that the significant factors in a young child's environment are all social, a word must be said of the influence of its physical character even though this has received little systematic study.

Physical Environmental Factors

Reports of young children's indomitable urge to exercise emerging motor skills suggest that their environment should provide *ample and safe opportunities for such activity*. Evidence that they spend the greater part of their time in contact with materials of some sort, and that they tend to assault their playmates when materials are in short supply, further suggests the importance of *manipulable materials*. Reports, therefore, such as those of Spitz (1946) and Goldfarb (1943, 1944) which relate children's behavior to lack of a fixed loving adult, raise a question as to the part played in these children's behavior by the accompanying lack of outlet for their practice of emerging skills and lack of opportunity to explore and manipulate.

The *character of materials in a child's environment, whether they are abstract or representative*, is also a factor in the activity they stimulate. In doll play sessions (Sears, 1947), more thematic or imaginative play was evoked with dolls and furniture that represented abstractions rather than exact replicas. One regrets, therefore, the constant elaboration of amusement parks for young children, by adults with little understanding of what amuses or interests a young child.

The part strangeness and unexpectedness play in children's fear reactions similarly suggests that children are more at home in a *familiar stable environment*. We noted, in this connection, that the period during which children are acquiring position concepts is also the period during which they are most insistent on having things in certain set places and thereby making their environments orderly and predictable. Against such a background of ordered familiarity, occasional variety can furnish satisfying stimulation. It would thus be illuminating to study children's response to art and construction materials when presented in different ways, in disorganized array as they sometimes are in play therapy sessions and in ways which suggest their constructive use. Such comparative study would clarify interpretations of children's activities in play therapy sessions.

In brief, the studies so far reported indicate that all young children are involved in interactions with their environment. The studies also indicate that certain kinds of experiences are associated with certain kinds of child behavior.

Does this mean that young children are completely at the mercy of their environment and that their behavior is the mold of their life circumstances? The magnitude of correlations obtained between children's life circumstances and their behavior dispels such a supposition. Nor is this the only evidence that children respond differently to the

same sequence of events. In intelligence testing, adverse home circumstances were associated with drops in level of performance in some children but not in all. In a study of children's response to being arbitrarily removed from an attractive play setting, most of the children regressed in the constructiveness of their play, but some did not.

Why are there such differences?

The Selective Nature of Children's Interaction with Their Environment

In the Institute of Child Welfare at the University of California the development of three groups of children has been studied over a span of many years: one group of 61 children (Bayley, 1956) from birth to adulthood, another group of 252 (Macfarlane, 1938) from eighteen months of age to adulthood, and a group of 158 children (Jones, 1938) from twelve years of age to adulthood. In each of these studies, relationships were found between children's characteristics and the responses they evoked from other persons. As illustration, adolescent boys who matured early were, at 14 or 15 years of age, taller and heavier, and hence better athletes than later maturers. Because of this they were also more popular with their age peers. Children's level of mental functioning was also reflected in their interaction with their environment. After three years of age their intelligence test scores correlated negatively with their number of behavior problems. This suggests either that the more *intelligent* were able to cope more effectively with their environment or that they had more favorable environments.

More significant, however, than relationships between children's mode of interaction with their environment and their life circumstances was the evidence of individual patterns of interaction. Some of these have already been discussed and have been graphically presented in Figure 96.

In reporting such patterns as these, all three investigators reached somewhat similar conclusions concerning human behavior. Bayley (1956), for instance, notes "individual patterns are the rule." Jones (1949) suggests that adults can lend the adolescent a helping hand as he struggles toward maturity, "always remembering, however, that it is the adolescent who must do the growing and in his own way." Macfarlane (1954), noting that some children made more adequate life adjustments than would have been predicted from their early experiences, concludes "unless handicapped by inadequate structure and

health and impossible and capricious learning situations—*the child*—threads his way to some measure of stable and characteristic patterning."

It seems clear then that the effect of environment on a child depends on the environment and on the child. The child's constitutional characteristics, native abilities, and rate of development play some part in the interaction. Macfarlane notes, for instance, that enuresis occurred more often in later maturing children of energetic impatient mothers. Here a combination of factors in mother and child were involved. Macfarlane also notes that problem behavior was associated, not with any one adverse family circumstance, but with a preponderance of adverse circumstances. In summing up she suggests that a child's interaction with his environment depends on what he has to adjust with and what he has to adjust to. Even with this broad understanding, she still does not reduce individual behavior to individual formulae. We can assume then that much has yet to be done in explaining the nature of individual patterns of human behavior. We can also assume that adults who work with young children make their greatest contribution in attempting to understand the individual pattern of each child in their care.

Review

THE CHILD from birth onward is a stimulus to his environment. His various characteristics evoke a selective response from other persons and in this way are an important factor in his interaction with them. In infancy, his helplessness makes him dependent on others for care and nurturance. The developmental and individual appropriateness of the nurturance he receives in turn determines whether he learns that he can depend on and trust others.

As he matures, his progressive development of sensori-motor coordination and intellectual functioning makes him able and eager to do things for himself. He is helped in achieving the independence his progressive maturity makes possible by the appropriateness of the external controls to which he is subjected. Over-control of situations he could handle himself robs him of experience and leads to angry dependence or forthright resistance. Harshly exercised control produces outward compliance, but feelings of rebellion which are revealed in projective play.

One way in which young children become independent of adults is through taking over or incorporating adult controls into their own behavior. They are, therefore, helped by consistent procedures and by

clear and simple statement of what adults want them to learn in the interests of their safety and well-being and that of others.

The influence of specific infant care practices on the child's mode of interaction with his environment is dependent on the pervasiveness of the frustration or gratification they offer. The permanence of such influence is likewise dependent on the extent to which it is reinforced or offset by later experiences.

The nature of the child's interactions with his siblings depends in part on the competition the siblings offer for parental interest and affection. It also depends on whether they offer a like-sex behavior model or congenial and stimulating companionship.

Interaction with his age peers subjects the child to the modifying influence of group opinion. What nursery school means to him, therefore, depends on the nature of his experiences with children and staff. As for broader community experiences, the effect on the child does not depend on the number and variety of behavior settings a child enters, but on the extent to which he penetrates them, the emotional climate he encounters, and the success or failure he experiences in each setting.

Though relationships have been found between children's life circumstances and the nature of their interaction with their environment, their pattern of interaction is not simply molded by their life circumstances. There is overwhelming evidence of individual patterns of adjustment which give to human personality its infinite variety.

Recommended Films

"The quiet one." Silent, 67 mins.
Film Documents, Inc.

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Chapter 13

PROBLEMS INHERENT IN THE STUDY OF HUMAN BEHAVIOR

What are the restrictions on use of the experimental method in studying human behavior?

In what different ways may a child respond to a disturbing stimulus or experience?

What is the function of "controls" in studying behavior?

What are some of these controls?

Is a positive correlation between an environmental variable (residential neighborhood) and children's behavior (intelligence test performance) proof that the variable causes the behavior?

Do an investigator's life experiences, his education, occupation, and social background influence his study of behavior and the conclusions he draws?

In the previous chapter it was indicated that our understanding of the development of behavior in early childhood is partial and provisional. In this concluding chapter it may be helpful to consider why this is so.

Aside from the fact that the development of behavior in early childhood received little systematic study until the twentieth century, its study, at any time, is beset by particular problems. A bare chronicling of these problems would suggest only the immensity of the task ahead. If instead we consider how the problems have been attacked so far, we may get some idea of the directions future study of human behavior is likely to take.

What are the basic problems in the study of human behavior?

We would probably agree that a scientist studying human behavior does not work in a social vacuum. His interests, attitudes, and selective attention are influenced by his academic training and experience, by biases in his personality which make certain hypotheses attractive to him, and by the social culture of which he is a part. In particular, the extent of human understanding at the time in which he is working necessarily determines, to some extent, the context of his thinking.

For example, reports on the nature of reflex activity published by Pavlov, a Russian physiologist, admittedly influenced Watson, an American psychologist, in his development of a theory of behavior based on a conditioning process. Watson's receptiveness to such an influence appears to stem from his interest in associative processes and in animal psychology. It may be, however, that current social philosophy reinforced such receptiveness. Faith that all men are created free and equal, and the corollary that any man can become what he wishes through his own efforts gains support from a mechanistic theory of behavior. Certainly, in the case of Freudian psychology, no thoughtful student overlooks the possible influence of an authoritarian father and a late Victorian social milieu on the concepts developed by Freud.

Problems in the study of human behavior are thus centered in human investigators and human understanding. They are, however, equally centered in human subjects and in the kinds of data that can be obtained about human behavior. Let us begin, then, by considering the kinds of problems posed by human subjects.

Problems Posed by Human Subjects

Restrictions on Use of Experimental Method

Human beings are not expendable, at least not for scientific purposes. The major circumstances of their lives cannot be altered or experimented with to test psychological hypotheses. Therefore the use of experimental method, on which scientific progress traditionally depends for crucial information, has to be restricted to synthetic labora-

tory situations. In such situations subjects are seldom emotionally involved. In contrast, in life situations, which are the ones we are interested in, intellect and emotion function inseparably.

Attempts have therefore been made to duplicate the psychological features of life situations in laboratory experiments. Thus the influence of reward on children's estimation of size has been studied by comparing their size estimate of tokens for which they always received a reward with their estimate of those for which they were not rewarded (Lambert, 1953). Similarly, the influence at different ages of success and failure on children's choice of activities has been studied by determining the extent to which they chose, in a free play period, puzzles they had been successful or unsuccessful in completing in a preceding trial period (Rosenzweig, 1945). The influence of frustration on their level of endeavor has also been studied in the laboratory by rating the constructiveness of children's use of play materials before and after a period of experimentally induced frustration (Barker, 1941).

Another method of relating laboratory experimentation to life situations is to compare children's behavior in a life situation before and after an experimental training period designed to modify their behavior. Illustrations of this method have been offered in studies of ascendant (Jack, 1934, Page, 1936) and dominant (Chittenden, 1942) behavior. You will recall that children rated as non-ascendant or aggressively dominant were given a training period designed to promote ascendance in the one case and integrative behavior in the other. Following this training period, children's ascendant or dominant behavior in the nursery school was then re-rated.

Studies such as these suggest that the value of the experimental method lies not in its employment per se, but in the value of the problem in which it is employed. The studies mentioned also reflect attempts to solve a related problem in the use of the experimental method on human subjects.

Lack of Genetic Controls

Human beings cannot be bred for experimental purposes. In experimentation, therefore, psychologists are handicapped not only by the restricted type of situations in which they can experiment but also by the lack of suitable control subjects. It is the essence of experimental procedure that the performance of experimental subjects be compared with that of control subjects, alike in all respects save in that of the variable studied. But, how can such controls be procured? It has already been noted that many millions of chromosome combinations

are possible in the conceptions of any two parents and that all human characteristics show a range in their distribution.

One solution is to employ identical or uniovular twins. As illustration, the efficacy of early and deferred practice in climbing stairs, combining cubes, and naming objects was compared in a series of studies which employed a pair of identical twins as subjects (Gesell, 1929).

Another solution, employed particularly in learning experiments, is to "match" children in terms of their initial performance on a task in which "experimental" children then recieve training not given to "control" children. This solution was used in comparing the efficacy of early and deferred practice given nursery school children in cutting with a scissors, buttoning, and climbing (Hilgard, 1932). As many individual characteristics contribute to the learning of any performance, it is obvious that this type of control is necessarily only partial in nature. Its efficacy depends on the extent to which matching has been based on *all* characteristics that could conceivably be related to the variable tested.

The most widely used solution is to employ the subject himself as a control, comparing his behavior under one set of conditions or at one stage of development with that of another. You will recall, in the study of early and late practice in climbing (Hilgard, 1932), that the experimental group made greater gains in performance toward the end of their weeks of practice. This suggested that developmental factors influenced their performance. Similarly, in the study of Johnny and Jimmy (McGraw, 1935), tricycle training given Johnny from nine months of age onward was unproductive until he was seventeen months of age. Differences in Johnny's response at different ages thus suggested that learning to ride a tricycle is dependent on developmental factors.

Incidentally, interpretation of differences in performance in two situations by the same group of subjects requires a different statistical procedure from that employed when two groups of subjects perform in a standard situation.

Control, however, involves other factors than genetic inheritance, and this brings us to another problem posed by human subjects.

Complexity of the Human Organism and Environment with Which It Interacts

Human beings are complex organisms functioning in a complex environment, so investigations of human behavior have to

deal with multiple factors of unknown weight interacting in a variety of ways.

Though it is obviously simpler to deal with or tease out one factor at a time when studying any phenomenon, when this method is used in the study of human behavior, it produces very low measures of relationship for single variables.

This is well illustrated in a recent study of the behavior problems of a large number of unselected children during the age span from twenty-one months to fourteen years of age (Macfarlane, 1954). In this study, a wealth of data concerning numerous aspects of the children's behavior and their home circumstances made it possible to compute vast numbers of correlations between single variables. Though positive relationships established in this way are interesting and suggestive, they are, as would be expected, quite low. It is, in fact, obvious from squaring [1] the correlations that they account for only a small proportion of the variance obtained.

This raises the question of whether there is any way of determining the influence of a combination of factors.

One solution is to use multiple correlations. In a report (Honzik, 1952) on intelligence test scores of 39 eighteen-year-old girls, an r of .47 was obtained between the girls' intelligence test scores and ratings of their mothers' intelligence. Correlations of .24, .25, .29, and .24 were also obtained between the girls' test scores and such maternal variables as affectionateness, worrisomeness, nervous instability, and marital adjustment. The multiple r between the girls' scores and combined intellective and non-intellective maternal variables was .72.

Multiple correlations thus make it possible to determine the highest percentage of variance that can be accounted for by combining all the single sources of variance that have been measured.

It is possible to extend the meaningfulness of a multiple r or any other r by examining the scattergram of scores for the variables correlated. As Figure 3, page 12 shows, the percentage of scores which fall within the shaded area of perfect agreement can be compared for the entire range and for the upper and lower extremes.

In this way we get some idea of whether relationships are higher or lower for extreme cases.

Sometimes, what an investigator wishes to determine is not the *magnitude* of the variance accounted for by interacting variables, but is rather *the probability that interacting variables are contributing to variance* in behavior in some way.

You will recall that in a study which related children's Primary

[1] The square of a correlation between variables x and y indicates the proportion of variance in x accounted for by y. See page 11.

Mental Abilities test scores to characteristics of their siblings, significant [2] relationships were found, not for single variables, but for the interaction of two or more of them (Koch, 1954). For example, sex differences in verbal ability were significant only when the children were first-born and had a sibling two to four years younger.

Analyses of variance of the sort undertaken here were made possible by a carefully thought out research design that permitted comparisons of the interaction between all possible combinations of the variables studied.

In studying the influence of interacting variables, a research design must therefore be developed which permits interaction of all the variables under study. To illustrate, the purpose of Koch's study was to determine the effect on Primary Mental Abilities test performance of all possible combinations of such variables as the child's sex and birth order, and the sex, age, and birth order of his sibling, and the age difference between himself and his sibling. Therefore a population sample of 360 five-year-old children who were members of two-child families was divided into twenty-four subgroups, which represented all the possible combinations of variables Koch wished to study. (See Table 14.) Each subgroup contained the same number of children (15) and each was matched in terms of age, fathers' occupation, and residential neighborhood. The reason for *matching* or *holding constant* these variables is that they have been found to contribute to test performance.

TABLE 14

AGE, SEX, AND BIRTH ORDER OF SUBJECTS AND SIBLINGS IN 24 SUBGROUPS

(From Koch, H. L. 1954)

			Sibling Age Difference		
Sex	*Ordinal Position*	*Sibling Sex*	*7–24 mos.* *n*	*25–48 mos.* *n*	*49–72 mos.* *n*
M	2	M	15	15	15
M	2	F	15	15	15
F	2	M	15	15	15
F	2	F	15	15	15
M	1	M	15	15	15
M	1	F	15	15	15
F	1	M	15	15	.15
F	1	F	15	15	15

[2] Differences that could occur by chance only once in a hundred times are considered *significant* because the *probability* is so slight that such a difference *could* be due to chance.

Another solution to the study of interacting variables is through factor analysis. You will recall that in a study of relationships between different kinds of motor performance in young children (Goodenough, 1935), a factor analysis suggested that two factors entered into the correlations obtained. One which decreased with age was termed "maturation," the other, which increased with age, was termed "carefulness."

The table of correlations (see Table 15) may serve to indicate that factor analysis is essentially a process of examining the correlations between a set of variables to determine which variables are consistent in correlating in the same direction + or − with each of the other variables. The variable which has the highest average correlation with the others furnishes a clue to the possible nature of the factor determining the relationships.

Perhaps this helps to make it clear that factor analysis is a mathematically simplifying procedure. It reduces the number of factors or variables an investigator has to deal with by lumping together those that seem to produce the same effect.

Though mathematically simplifying, it is not an explanatory process. It may *help* the investigator to explain the relationships he has found or *it may not*, but it doesn't explain them for him. He still has to explain mathematically derived factors by relating them to his data in a meaningful way.

This is true of all statistical procedures. When appropriately chosen they can *help* an investigator to get more meaning out of his results.

Evidence of a common factor operating in a number of different performances introduces another problem also inherent in the complexity of human behavior.

Multiple Modes of Response

Human beings have many modes of response to stimulation. A small child approached by a big dog may run crying to his mother, may have a quickened heart beat, may feel terrified.

The problem of multiple responses to a single stimulus is attacked by attempts to study and relate the overt, physiological, and subjective responses of human subjects to different stimuli. This is nowhere better illustrated than in the meticulous recording of infants' physiological and overt responses to sensory stimuli of quantified strength and duration (Pratt, 1930).

Relationships between children's overt and physiological responses

TABLE 15

TABLE OF CORRELATIONS FROM WHICH A FACTOR ANALYSIS WAS MADE

(From Goodenough, F. L. 1935)

Performance of 24 children 3½ years of age

	Walking path: speed	*Walking path: fewness of errors*	*Finger tapping*	*Speed at needle threading*	*Three-hole test*	*Stylus tapping*	*Simple reaction speed*
Walking path: speed	—	−.01	−.21	−.22	+.18	−.27	−.34
Walking path: fewness of errors	−.01	—	−.27	−.11	+.31	−.08	+.13
Finger tapping	−.21	−.27	—	+.26	+.54	+.46	+.15
Speed at needle threading	−.22	−.11	+.26	—	+.30	+.42	+.16
Three-hole test	+.18	+.31	+.54	+.30	—	+.08	+.14
Stylus tapping	−.27	−.08	+.46	+.42	+.08	—	−.08
Simple reaction speed	−.34	+.13	+.15	+.16	+.14	−.08	—

have also been explored by comparing their psychogalvanic and overt responses to disturbing situations (Jones, 1935). You will recall that three distinguishing patterns of response were noted. One was externalizing or responding to stimuli overtly. Another was internalizing or responding physiologically, and the third was generalizing or responding both overtly and physiologically. Undoubtedly children differ in the extent to which their behavior reflects these three patterns. Most of them probably do some internalizing and some externalizing.

Relationships have also been sought between children's overt responses and their subjective feelings. One way of getting some indication of children's "feelings" is to observe their behavior in a projective test. In such a test it is assumed that children reveal feelings they do not feel free to express overtly.

As an example, Figure 89, page 319, shows that mildly punished children were equally aggressive in play and in projective doll play sessions. In contrast, harshly punished children showed little aggression in play, but considerable aggression in projective doll play. These studies suggest that we cannot always tell from a child's overt reactions what a particular experience means to him.

The significance of behavior and experience at any one age can be seen in better perspective when related to the course of behavior over the entire life span. The life span of any animal species is, therefore, a factor in the kind of studies that can be made on its behavior.

Human Life Span

Human beings have a long life span which is incidentally the same as that of their investigators. Because of this, it is impossible for the same investigator to study the behavior of the same individuals over their entire life span.

In partial solution of this problem the behavior of large numbers of individuals has been studied by the same investigator over periods of as long as twenty to thirty years. Thus we have a wealth of information concerning the stability of various behavior charcteristics during the first twenty years of life (Bayley, 1949, Honzik, 1948, Macfarlane, 1954).

Longitudinal studies, such as these, are complicated by changes in population sample due to subjects being "lost" from the study and by the investigators' commitment to a general plan or procedure which cannot be substantially changed to take advantage of the advances that occur in any scientific field over one or two decades. These dis-

advantages, however, are far outweighed by the perspective on human behavior which longitudinal studies alone make possible.

In another solution to this problem, observations made by one observer have been compared with similar observations made years later by another observer. This solution is illustrated in the comparison referred to earlier between personality sketches prepared on fifteen children when they were two and when they were seventeen years of age (Neilon, 1948), with one investigator doing the first set of sketches, another the second. You may recall too that judges, working independently, "matched" these descriptive sketches with an accuracy much higher than would have resulted from chance.

Human beings in addition to having a long life span have a long period of immaturity during which their behavior reflects individual rates and patterns of development.

Individual Rates and Patterns of Development

The differentiation of individual rates and patterns of development requires analytic procedures that make this differentiation possible.

Statistical procedures have, therefore, been employed to compare developmental patterns in the behavior of members of a group of children who have all been studied over a span of years.

As illustration of such a procedure, the conversion of a group of children's intelligence test scores into standard or sigma scores made possible the differentiation of such individual patterns of development as those shown earlier in Figure 96.

Similarly comparisons of fluctuations relative to the group in height and in motor and intelligence test performance revealed such different patterns of development as those shown in Figure 86.

The cited methods of study and statistical analysis all suggest that problems in the study of human behavior which center in the quality of human subjects are at least in process of solution. What of the problems the investigator himself introduces in the form of his perceptual biases, which reflect the acculturation or socialization process he underwent in growing up in a particular subgroup of our society?

Problems Centering in Human Investigators

Investigators inherit a ready-made terminology for behavior variables that are as yet incompletely understood. This is be-

cause human behavior has been observed and evaluated for centuries. There is therefore in circulation a host of man-in-the-street terms for types of behavior that are based on man-in-the-street perceptions. When a psychologist applies these terms to behavior variables which he perceives in terms of the limitations of his method of study, considerable semantic confusion results. The confusion is compounded when other social scientists, sociologists, anthropologists, or political scientists use the same terms for perceptions limited by *their* methods of study. In the resulting Tower of Babel there is a common language, but no common understanding.

Perceptual Biases Resulting from Culturally Derived Behavior Terminology

This is well illustrated in the use of the term "intelligence." Used by the man in the street, it may designate some one who thinks the same way he does. Used by the psychologist in his laboratory, it designates level of performance on a particular test of selected intellectual functions, relative to that of some other persons similarly tested.

Think what would have happened if medical scientists had restricted themselves to the terms used by the lay population to differentiate between states of health and disease. To illustrate the terminology problem in the behavioral sciences, let us consider the term "anxiety." It is used to refer to a state of mind which keeps an individual on his toes. It is also used to refer to a state of mind likely to keep the same individual figuratively on his knees. On what basis do we make the assumption that these two states represent a mild-to-severe continuum?

Other terms such as "frustration" and "punitiveness" are similarly confusing. It is therefore no wonder that a curvilinear relationship is found between parental punitiveness and children's overt aggressive behavior. (See Figure 89, page 319.) The difference between low and high "punitiveness" is obviously qualitative as well as quantitative.

These problems are beginning to be attacked by describing behavior variables in operational terms. There is thus an increasing tendency to speak of Stanford Binet Intelligence Test or Primary Mental Abilities Test scores rather than of high or low intelligence.

The behavioral scientists' life experiences as well as the behavioral terminology he has used from the cradle modify his perceptions of human behavior and thereby create another problem.

Perceptual Biases Resulting from Investigators' Life Experiences

Investigators study behavior in a society made up of subgroups in one of which they have themselves become socialized. It is therefore reasonable to suppose that their social values, attitudes, and interpretations of behavior may be influenced by *their* social experiences.

Socialization Experiences

Everybody's attitudes are shaped in multiform ways by the socioeconomic, religious, and cultural environment in which they are reared; as an example, Kinsey's studies show that lower class groups are less critical of premarital sexual intercourse than upper class groups, but more critical of petting activities. Recognition of the influence of our individual backgrounds on our thinking should lead us to examine critically the tests devised by college educated investigators, which record superior performances for children of college educated parents on practically all desirable intellectual and social behaviors.

Is it possible that the content, procedures, and interpretations employed in such tests are based on assumptions which are valid only for the social subgroup with which the investigator is familiar?

We must be equally critical in considering interpretations of child behavior made by European psychoanalysts. Is it possible that their interpretations are based on assumptions about parent attitudes and practices which are valid only for the European subgroup in which the investigator spent his childhood?

This problem has been attacked by comparing the life circumstances of children in different subgroups in our society and in different societies. Illustrative of this attack are comparisons of child-care practices reported by Negro and white mothers in lower- and middle-class groups in Chicago (Davis, 1946) and in Boston (Maccoby, 1954). You will recall that there were differences in results in these two studies. The differences suggest that, in our society, parental practices and early childhood experience of one decade are not necessarily those of another, and that factors other than parents' income, education, and occupation differentiate subgroups in terms of child care practices.

Studies such as these involving parents' reports of child care practices offer information concerning only a part of a young child's life

experience. In an attempt to obtain more comprehensive information, an ecological approach has been attempted (Barker, 1955). In a study using this approach a team of research workers lived in and became a *neutral* part of a small community in Kansas (see page 384). By becoming a part of this community, research workers developed classifications of behavior settings and behavior episodes that were "true" for this community. This happened because the research workers were not only *with* the people, they became *of* the people they studied.

Studies of some of the life experiences of children in primitive societies have also been undertaken. As illustration, one (Whiting, 1953) was based on analyses of accumulated ethnological data on 75 primitive societies. The data, however, was originally gathered by different investigators using somewhat different methods and recording at different dates.

In a somewhat different approach, attempts have also been made to spot crucial and characteristic features in the life experiences of children in some European countries (Mead, 1955). This was done by such varied means as observing parents' and children's behavior in public parks, by analyzing literature on child rearing, stories and verses written for and about children, and films from different countries in which children were central characters.

Thus attempts have been made to overcome perceptual biases that may arise when investigators who are members of one subgroup of society study behavior in another subgroup. Investigators are, however, not only members of a social subgroup; many are also professionally employed in modifying as well as investigating young children's behavior. Some, therefore, create a problem by failing to distinguish between their systematic and incidental sources of evidence.

Occupational Experience

Many investigators of young children's behavior are also nursery school teachers, psychiatrists, pediatricians, or psychiatric social workers. In their professions it is necessary for these workers to piece out the evidence from research with evidence gleaned from experience. Though this procedure is justifiable in professional practice, it creates confusion in research reporting when the procedure is reversed and an investigator attempts to piece out his research evidence with unspecified incidental professional observations.

This does not mean that such professional observations or the insights derived from them *may* not be valuable; it means only that they should be distinguished from research evidence which is evidence ob-

tained under controlled conditions. As such it can be retested under similar conditions or assessed in terms of the procedures employed, a process that is not possible with professional insights.

How is this problem attacked?

This problem is minimized as a result of published reports being subject to critical review by other investigators. Examples of such critical review are a psychologist's (Pinneau, 1955) detailed analyses of the evidence presented to support published conclusions that lack of "mothering" and "institutionalization" affect the behavior and well-being of infants. Here it was not the conclusions (which incidentally appear to be *plausible hypotheses*) that were attacked, but the character of the evidence on which they were based.

Similarly in a review of reports on the relationships between infant care practices and adult personality (Orlansky, 1949), an anthropologist's careful sifting of the evidence available at the time of his review made it clear that research support for such a relationship was lacking. This did not rule out the possibility that a relationship might exist but did make clear that it was not established on the basis of *research* evidence.

What these critical reviews make clear is that investigators must be particularly on their guard when they study behavior which they have made their mind up about in advance. Perhaps the best way of meeting this problem is for investigators to remind themselves that the more plausible the hypothesis, the more rigorously it must be tested.

The rigor with which an hypothesis can be tested is, however, dependent on the kind of data that can be obtained.

Problems Centered in the Kind of Data That Can Be Obtained on Human Behavior

As young children's life circumstances cannot be controlled, much of the information concerning their behavior derives from observations made in "natural situations." Such observations pose a problem in the operation of uncontrolled variables.

Uncontrolled Variables in Observations Made in "Natural Situations"

This problem has been minimized by controlling the conditions under which the observer observes. This is well illustrated in

an observational study of young children's social participation during free play periods in a nursery school (Parten, 1932). Here, though the situation was relatively uncontrolled and the child subjects free to behave in whatever way the nursery school circumstances permitted, the *observer was controlled* with regard to the type of behavior he recorded, the way in which he recorded, and the time interval, time of day, and duration of the observation. Table 16 summarizes the variables held constant and suggests the extent to which uncontrolled variables can be minimized in an observational study.

TABLE 16

VARIABLES HELD CONSTANT IN MAKING SYSTEMATIC OBSERVATIONS OF CHILDREN'S BEHAVIOR IN A NATURAL SITUATION

Behavior:	Observations limited to specific categories or items of behavior that are objectively and precisely defined.
Behavior frequency:	Behavior items are recorded in terms of a selected time unit such as 15, 30, or 60 seconds.
Length of observation:	Length of daily or weekly observations is the same for each child.
Number of observations:	Number of observations is the same for each child.
Time of day:	Times of day during which observations are made are the same for each child.
Recording:	Observations are recorded in standard form.
Reliability or consistency of observers:	A measure of consistency of the observer is obtained by computing the percentage agreement between two trained observers recording simultaneously and independently.

As time-sampling observations are extremely time consuming and not feasible in all natural situations, attempts have also been made to get information concerning children's behavior in these situations in the form of ratings. The ratings are made by adults who know the children well. Though ratings have the advantage of being meaningful because they represent a type of comparative judgment in common usage, they also pose problems. They are subjective and hence liable to bias, and they permit only the degree of differentiation the rating scale permits.

Subjective Bias and Limited Differentiation in Behavior Ratings

These problems have been minimized by rating procedures aimed at reducing bias and increasing differentiation. Thus in a rating scale employed in rating home variables (Champney, 1941), the procedures summarized in Table 17 were based on earlier determinations (Conrad, 1932) of factors associated with high agreement between independent raters.

TABLE 17

SUMMARY OF PROCEDURES USED TO REDUCE THE SUBJECTIVE ERROR IN RATING BEHAVIOR TRAITS

Definition of behavior traits:	Descriptions are placed at intervals along a vertical line which represents a range in a particular behavior trait.
Rating scale units:	Ratings are made on the line continuum, mentioned above. Scale units are obtained by measuring the distance up or down from the midpoint of the line. Thus on a 10 centimeter scale a positive or negative score of 0–5 can be obtained.
Rating procedure:	In rating a number of individuals on a number of traits, a number of people are rated on one trait at a time instead of rating one person on a number of traits. This is done to avoid the "halo effect" that results from compounded judgments.
Pooled ratings:	An average score from several raters, each equally acquainted with the individuals rated, increases the reliability of the ratings.
Confidence in ratings:	Ratings of which rater feels confident are circled.
Significance of rated trait:	A rated trait which is a significant aspect of an individual's personality is underlined.

Obviously when ratings can be based on the average of several raters, each equally acquainted with the subjects rated, such pooled judgments give a more reliable measure than can be obtained with a single rater.

The attempts made to limit variables in observational and rating procedures suggest that naturally occurring life situations or circumstances, besides restricting the method of study possible, pose other problems. One such problem is that differences in behavior in two groups of children in a "natural" situation may be due to chance rather than to the operation of a specific variable or variables.

Operation of Chance

It is, of course, evident that differences established on the basis of a large number of measurements or cases can *generally* be accepted with greater confidence than those established on the basis of a few. To illustrate, in predicting the outcome of a presidential election the vote tally from one precinct is not particularly helpful. Many have to be heard from before even the hardiest newscaster begins to predict with confidence. It is, however, only by using statistical procedures that we can measure the degree of confidence that can be placed in a predicted outcome or an observed difference in behavior between two groups of children.

A number of statistical procedures have, therefore, been devel-

oped to measure the significance of observed differences in behavior. The one best suited for a particular case is selected on the basis of the number of cases or measurements involved, the distribution of the measurements (normal or skewed), and the evidence of relationship in the circumstances compared. To elaborate on this last point, we noted earlier that measuring the significance of a difference in performance in the same children at different ages calls for a different statistical procedure from that used in measuring a difference between two groups of children. Whatever the measure used, it permits interpretation in terms of the number of times in a hundred that the differences obtained could have occurred by chance (see footnote, page 398).

Data on behavior occurring in natural situations are often presented in measures of relationship. These, like measures of significance, offer limited information and must be interpreted in terms of their limitations.

Limited Information in Measures of Relationship

Evidence of relationship is not evidence of causality. Consider the case of the legendary dipsomaniac who drank scotch and soda and became drunk, then bourbon and soda, and later bacardi and soda with the same result, and concluded soberly that in future he had better avoid soda.

Measures of relationship such as correlations, therefore, have a descriptive rather than an explanatory function when the variables correlated are not experimentally controlled.

In one solution of this problem hypotheses suggested by correlations have been submitted to experimental test. Thus, in a comparison of spoken vocabulary test scores (Williams, 1937) of children in a university nursery school and in an orphanage, the correlations suggested that age had little effect on vocabulary in an orphanage ($r = .13$), but had much more effect on vocabulary when the children lived in a stimulating environment ($r = .49$). This, in turn, suggested that lack of environmental stimulation was a factor in, or cause of, low vocabulary scores in orphanage children. This hypothesis was submitted to test by dividing 22 orphanage children into an experimental and a control group, matched on the basis of school group, age, sex, mental age, IQ, and score in a spoken vocabulary test (Dawe, 1942). You will recall that after the experimental group was given a period of environmental stimulation they made significant gains in language,

concept, and intelligence test scores (Figure 53, page 158). The hypothesis that earlier correlations suggested was therefore supported by this experiment.

In summary, the complexity of human behavior, the number of variables involved, and the dimensions of these variables all suggest that it cannot be effectively studied in terms of any one hypothesis. We must ask not one but many questions in studying any kind of behavior. Therefore we must have research designs which make it possible to get answers to these questions.

The complexity of human behavior further suggests that its investigation requires not only more than one hypothesis, but also more than one discipline. Behavior research teams will, in the future, increasingly include physiologists and biochemists as well as psychologists, sociologists, and anthropologists.

The evidence of individual patterns of behavior is also a reminder that the behavior of an individual represents a complex interaction of variables. Therefore, individuals merit separate, systematic, intensive, comparative study. The proper study of mankind is man, not men. If you want to learn more about young children's behavior in the limited laboratory periods that are a student's lot, make many related observations on a few children, rather than a few observations of many children.

Review

Problems inherent in the study of human behavior are centered in human subjects, human investigators, and the kinds of data that can be obtained on human behavior.

Use of the experimental method in working with human subjects is restricted to laboratory situations. In these it is difficult to duplicate life situations though life situations are the ones we wish to learn about. The complexity of the human organism also complicates the study of behavior by requiring a multidimensional approach.

In addition human investigators are handicapped by having preconceived notions about behavior that are the natural outcome of their life experiences. They are also handicapped by a behavior terminology that is based on preconceived notions rather than on systematic study. This problem is being solved, to some extent, by defining behavior variables in specific operational terms.

Data on behavior in life situations are difficult to interpret because the variables in these situations are not controlled and sometimes not even identified.

Though problems such as these are not yet solved, they are being minimized by the development of effective research designs, by the collaboration of biological and social scientists, and by the use of statistical procedures which make it possible for an investigator to interpret his data in terms of mathematical probabilities.

One investigator concludes that current charting of human behavior is like an eleventh-century map of the world. Perhaps so, but it is worth remembering that from the maps of earlier centuries we progressed to the cartography of today.

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A NOTE ON THE TYPE

This book was set on the Linotype in JANSON, *a recutting made direct from the type cast from matrices made by Anton Janson. Whether or not Janson was of Dutch ancestry is not known, but it is known that he purchased a foundry and was a practicing type-founder in Leipzig during the years 1660 to 1687. Janson's first specimen sheet was issued in 1675. His successor issued a specimen sheet showing all of the Janson types in 1689.*

His type is an excellent example of the influential and sturdy Dutch types that prevailed in England prior to the development by William Caslon of his own incomparable designs, which he evolved from these Dutch faces. The Dutch in their turn had been influenced by Garamond in France. The general tone of Janson, however, is darker than Garamond and has a sturdiness and substance quite different from its predecessors. It is a highly legible type, and its individual letters have a pleasing variety of design. Its heavy and light strokes make it sharp and clear, and the full-page effect is characterful and harmonious.

This book was composed, printed, and bound by Kingsport Press, Inc., Kingsport, Tennessee. The paper was manufactured by the P. H. Glatfelter Company, Spring Grove, Pennsylvania. Designed by Guy Fleming.